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NRL Memorandum Report 6514

NRL/VOA Modifications to IONCAP as of 12 July 1988

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*Ionospheric Effects Branch
Space Science Division*

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NRL/VOA MODIFICATIONS TO IONCAP AS OF 12 JULY 1989

I. INTRODUCTION

The Ionospheric Effects Branch of the Naval Research Laboratory, at the request of the Voice of America/United States Information Agency, has performed several studies of HF ionospheric propagation which involve use of the IONCAP propagation prediction computer program. IONCAP, created by the National Telecommunications and Information Administration (NTIA), is the leading program for computing the performance of HF skywave propagation systems. The IONCAP 78.03 version has been documented in NTIA Report 83-127. The NRL/VOA work started with the IONCAP 85.04 version, which has been gradually modified to adapt to differences in computer hardware, to correct a few small coding errors, and to provide output which is more suitable for VOA requirements. Because of the large number of VOA and NRL personnel who are using the program and its results, and because the currently-calculated results are likely to be used for many years to come, it is considered imperative that an accurate record of program modifications be maintained. Because of the evolutionary nature of the modifications, continuous documentation is difficult, but it is possible to document the modified program from time to time. This document therefore describes the modifications made to IONCAP as of 12 July 1989. It is planned that further modifications will be described in future reports.

This report makes no attempt to fully document the Modified IONCAP program; it describes only the modifications which have been made to make it more suitable for NRL/VOA use. Modifications are described on two levels: a general, functional description, and a detailed line-by-line description of the FORTRAN changes. Thus Section II lists, in approximate order of importance, the modifications which have been made, the extent of the modifications, and the rationale for making them. Section III contains listings of the differences between the original and the modified programs, which will permit a user to recreate the NRL/VOA modified program from the original IONCAP 85.04.

An overview of which subprograms had been modified, and of the extent of the modifications, was obtained by running the VAX DIFFERENCES program on all of the IONCAP modules. The extent of the results is summarized in Table 1, and the full DIFFERENCES data is reproduced in Section VI of this report. Table 1 lists all of the IONCAP modules, as well as the number of sections in each module in which differences were found between IONCAP 85.04 and the Modified IONCAP, and the total number of different records found in each module. The list includes the programs IONCAP_LTD (the long-term data base which accompanied IONCAP 85.04), and BCDBIN.FOR (which transforms the long-term data base back and forth between its ASCII and binary representations). To enable either of the old or new long-term data bases to be used, the new one was named NEW_IONCAP.LTD. In addition, Table 1 includes the file MAKDAT.FOR, a utility program used for creating a special pair of transmitter and receiver antenna patterns which satisfy particular VOA requirements. (See Section IIP.)

Manuscript approved June 8, 1989.



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An important part of documentation is the retention of both original and modified versions in archival form. The current documentation consists of the following products:

1. The original IONCAP 85.04 program modules stored in the NRL Space Sciences Division VAX computer area USD1:[VOALIB.IONCAP.SOURCE];
2. A 9-track magnetic tape containing the above information, with the label "IONCAP 85.04 -- Original Version -- 27 November 1985";
3. A listing of the FORTRAN code contained in IONCAP 85.04, with the label "IONCAP 85.04 -- original version at NRL -- 27 November 1985";
4. The Modified IONCAP program stored in the NRL Space Sciences Division VAX computer area USD1:[VOALIB.NEWCAP.SOURCE];
5. A 9-track magnetic tape containing the above information, with the label "IONCAP 85.04 with NRL/VOA modifications as of 12 JULY 1988";
6. A listing of the FORTRAN code contained in the Modified IONCAP, with the label "FORTRAN Source Code for IONCAP 85.04 with NRL/VOA Modifications as of 12 July 1988".
7. This document.

TABLE 1: DIRECTORY OF IONCAP MODULES

MODULE	NAME	SIZE (128BYTE BLOCKS)	DIFFERENCES IN REVISED IONCAP	
			# SECTIONS	# RECORDS
1	AERIAL.FOR;1	12	2	2
	ALLMODES.FOR	14	(Exists in Modified IONCAP only)	
2	ALOSFV.FOR;1	9	1	3
3	ANOIS1.FOR;1	4	1	6
4	BABS.FOR;1	3	2	4
5	BCDBIN.FOR;	13		
6	BEARNG.FOR;1	3	1	3
7	BENDY.FOR;1	1	1	3
8	BLKDAT.FOR;1	27	14	32
9	CALVHF.FOR;1	5	2	2
10	CISI.FOR;1	3	0	0
11	CNGTIM.FOR;1	4	0	0
12	CONVH.FOR;1	2	0	0
13	CURMUF.FOR;1	23	2	12
14	DECRED.FOR;1	56	7	25
15	DIREAD.FOR;1	1	1	2
16	EF1VAR.FOR;1	5	2	6
17	ESIND.FOR;1	3	1	3
18	ESMOD.FOR;1	14	6	31
19	ESREG.FOR;1	23	5	37
20	ESVHF.FOR;1	11	2	11
21	F2DIS.FOR;1	3	0	0
22	F2VAR.FOR;1	6	1	6
23	FDIST.FOR;1	7	2	9
24	FINDF.FOR;1	14	3	11
25	FIXLIN.FOR;1	2	1	1
26	FLOLIN.FOR;1	3	2	7
27	FNORML.FOR;1	2	0	0
28	FOBBY.FOR;1	3	1	7
29	FRQCOM.FOR;1	6	1	1
30	FVHF.FOR;1	6	3	9
31	GAIN.FOR;1	33	0	0
32	GENFAM.FOR;1	3	0	0
33	GENION.FOR;1	9	1	6
34	GENOIS.FOR;1	11	4	188
35	GEOM.FOR;1	14	2	8
36	GEOTIM.FOR;1	4	2	12
37	GETANT.FOR;1	6	0	0
38	GETHP.FOR;1	7	1	6
39	GETKMF.FOR;1	1	0	0
40	GETLUF.FOR;1	8	(Exists in IONCAP 85.04 only)	
41	GETTOP.FOR;1	4	1	5
42	GMLOSS.FOR;1	4	2	9
43	GPHBOD.FOR;1	15	1	1
44	HFMUFS.FOR;1	15	10	91
45	INMOD.FOR;1	10	8	30
46	INMUF.FOR;1	11	1	4
47	IONCAP.FOR;1	6	4	207
48	IONCAP_LTD.ASCII (85.04); NEW_LTD.ASCII (Modified IONCAP)			
		2721	5	2800
49	IONPLT.FOR;1	11	5	17
50	IONSET.FOR;1	4	1	3
51	LECDEN.FOR;1	13	2	8

TABLE 1: DIRECTORY OF IONCAP MODULES (Cont.)

MODULE	NAME	SIZE (128BYTE BLOCKS)	DIFFERENCES IN REVISED IONCAP	
			# SECTIONS	# RECORDS
52	LISTIN.FOR;1	10	2	4
53	LNG LUF.FOR;1	9	(Exists in IONCAP 85.04 only)	
54	LNGOUT.FOR;1	5	4	20
55	LNGPAT.FOR;1	11	3	18
56	LUFFY.FOR;1	16	8	290
57	MAGFIN.FOR;1	8	0	0
58	MAGVAR.FOR;1	3	1	3
59	MAKDAT.FOR;1	5		
60	MONITR.FOR;1	4	0	0
61	MPATH.FOR;1	3	3	10
62	NOISY.FOR;1	5	0	0
63	NOMMUF.FOR;1	7	1	7
64	OUTALL.FOR;1	17	9	168
65	OUTANT.FOR;1	10	5	7
66	OUTBOD.FOR;1	13	7	38
67	OUTCOM.FOR;1	2	0	0
68	OUTGPH.FOR;1	2	0	0
69	OUTION.FOR;1	1	1	3
70	OUTKMF.FOR;1	1	0	0
71	OUTLAY.FOR;1	3	1	1
72	OUTLIN.FOR;1	2	0	0
73	OUTLNG.FOR;1	4	3	5
74	OUTMUF.FOR;1	6	1	1
75	OUTPAR.FOR;1	6	4	21
76	OUTTAB.FOR;1	2	1	1
77	OUTTOP.FOR;1	12	4	9
78	PEN.FOR;1	1	1	3
79	PENANG.FOR;1	6	2	5
80	PRBMUF.FOR;1	4	1	1
81	REDMAP.FOR;1	14	4	5
82	REGMOD.FOR;1	20	7	61
83	RELBIL.FOR;1	15	10	125
84	SANG.FOR;1	3	1	4
85	SELMOD.FOR;1	3	1	3
86	SELR CR.FOR;1	5	1	12
87	SELTMT.FOR;1	5	3	8
88	SERPRB.FOR;1	7	4	23
89	SETGPH.FOR;1	5	0	0
90	SETLNG.FOR;1	6	5	13
91	SETLUF.FOR;1	3	2	3
92	SETOUT.FOR;1	9	2	2
93	SETRCR.FOR;1	11	2	22
94	SETTMT.FOR;1	12	2	22
95	SHTLUF.FOR;1	13	(Exists in IONCAP 85.04 only)	
96	SIGDIS.FOR;1	11	2	14
97	SYSSY.FOR;1	4	0	0
98	TABBOD.FOR;1	7	1	1
99	TABS.FOR;1	2	1	5
100	TIMVAR.FOR;1	5	1	5
101	VERSY.FOR;1	6	2	4
102	VIRTIM.FOR;1	5	2	6
103	XLIN.FOR;1	2	0	0

II. DESCRIPTIONS OF MAJOR MODIFICATIONS

A. Changes in System Performance Calculations and in Method 25 (All Modes) Output

Several changes have been made to the System Performance calculations, Methods 16-25, and especially to the Method 25 (All Modes) output calculations and format, to make the data more accurate and readable. The basic change is to present the performance data separately for each propagating mode, in addition to the summary which reports the collective effect of all contributing modes. This contrasts with the procedure in IONCAP 85.04, in which separate summaries are given for the collections of all n -hop modes, all the $(n+1)$ -hop modes, and all $(n+2)$ -hop modes (where n is the lowest hop number of all contributing modes), with an additional summary for the collective effect of all contributing modes. The change corrects a condition in IONCAP 85.04 in which summary data for lower-hop modes sometimes appears in columns where higher-hop data should appear, and in which signal strength calculations appearing in the System Performance outputs of Methods 16-26 could be in error by as much as 3 dB.

In IONCAP 85.04, the system performance of an HF path is calculated in a series of steps. Calculations are made for the smallest number of hops (n) for which propagation is possible, and also for the next two larger number of hops ($n+1$ and $n+2$). In the first step, the performances of all n -hop modes (E, F1, and F2, both LO and HI ray) are calculated, and the most reliable of these, termed the n -hop Most Reliable Mode (n -hop MRM) is identified. In the output data, the propagation characteristics of this mode are tabulated in the first column, along with the signal strength, noise, and reliability measures for the circuit derived from an rms summation of contributions from all of the n -hop propagating modes. In succeeding steps, the $(n+1)$ -hop MRM and $(n+2)$ -hop MRM are identified, and the corresponding propagation and performance data are printed in the second and third columns. The performances of one- and two-hop sporadic E modes are also calculated, if they exist, and those data are printed in columns 4 and 5. Then, in a comparison of these five selected modes, the one with the greatest reliability is identified and designated the System MRM. The system performance quantities for the System MRM are derived from an rms summation of the contributions from all five listed modes. The Method 25 output tabulates the performance properties of the five selected modes, and also of the System MRM.

However, a problem arises in the IONCAP 85.04 system performance calculations when no $(n+1)$ -hop and/or no $(n+2)$ -hop modes exist. In this situation the program (incorrectly) may retain the data for some lower-hop mode and use it as the $(n+1)$ -hop or $(n+2)$ -hop MRM data. The consequence, in Method 20, is the presence of spurious listings in the output data for the $(n+1)$ -hop and/or $(n+2)$ -hop modes, and in all of the System Performance Methods 16-26, an error of up to 3 dB in the signal strength of the System MRM.

This problem has been corrected in the Modified IONCAP by saving the data for all of the propagating modes, and only then calculating the Most Reliable Mode. In addition, the Method 25 output has been modified to list the performance results for each of the modes separately, and also for the Most Reliable Mode, with the system performance. There can be up to 20 of these modes.

The modified output format can be illustrated by a comparison of output data obtained with the input data file shown in Figure 1. Figure 2a shows the IONCAP 85.04 data for one frequency-time combination, and Figure 2b shows the corresponding data from the Modified IONCAP program. Where IONCAP 85.04 lists three modes, which are the most reliable 5-hop, most reliable 6-hop, and most reliable 7-hop modes, the Modified IONCAP lists nine modes: the three propagating modes for each of 5, 6, and 7 hops. (There could be up to eighteen of these modes, plus two sporadic E modes.) In the first column of IONCAP mode data, the heading 5.F2 means that the 5.F2 mode is the most reliable of all 5-hop modes, and the eight propagation characteristics which follow (time delay, angle, virtual height, transmission loss, transmitter and receiver gains, absorption, and FS loss) refer to that mode. The rest of the quantities in the column, however, refer to the sum of all (three) 5-hop modes. In the corresponding columns of Modified IONCAP data, all quantities refer to the single mode listed as the heading. In both IONCAP 85.04 and Modified IONCAP, the last data column is headed with the name of the most reliable mode (regardless of number of hops), and the first six propagation quantities refer to that mode, but the remaining ones refer to the combination of all contributing modes.

An example demonstrating the elimination of spurious data is shown in Figures 3 (input data) and 4a,b. In this example, there are three regular (non-sporadic E) 1-hop modes, and no regular 2- or 3-hop modes. In the IONCAP 85.04 output, the first mode-data column is properly headed with the name of the most reliable mode, 1.F1, and contains propagation data for that mode and reliability data for the sum of all 1-hop modes. The second and third data columns should be blank, since 2- and 3-hop modes don't exist in this case. However, they actually contain residual data left over from the 1-hop calculations. The problem doesn't arise in the Modified IONCAP data because the number of columns is adjusted to equal the number of propagating modes.

The process of storing data for all propagating modes is implemented by calls from subroutines INMOD and LUFFY to a new subroutine named SUBROUTINE ALLMODES(IFLG,FVAL). In this subroutine, performance data for all the propagating modes are stored in a set of arrays (in the new common block /ALLMODE/) from which the new Method 25 data are selected and printed out. The parameters used to call the ALLMODES(IFLG,FVAL) subroutine have the following significance:

1. ALLMODES is called from LUFFY with four calls:
 - 1st call (initialization):
 - IFLG=0
 - FVAL=current frequency being processed in the LUFFY frequency loop
 - 2nd call (for short-paths, for each value of hop in hop loop):
 - IFLG=100 or 300, for system performance or LUF calculations, respectively
 - FVAL=number of hops

IONOSPHERIC COMMUNICATIONS ANALYSIS AND PREDICTION PROGRAM - IONCAP VERSION 88.01

	1	2	3	4	5	6	7	8
1234567890123456789012345678901234567890123456789012345678901234567890								
MONTH	1987	9						
SUNSPOT	97.							
LABEL	FORT COLLINS TO HIRAISSO, IBARAKI, JAPAN							
CIRCUIT	40.68N	105.0W	36.37N	140.6E				0
SYSTEM	7.10	145.	10	90.	73.	3.	1	
TIME	1	1	1	1				
METHOD	25							
ANTENNA	1	2	.01	10.	-0.5	0.		
ANTENNA	2	2	.01	10.	4.50	0.		
FREQUENCY	6.08							
EXECUTE								
QUIT								

Figure 1. Data file used to show differences between IONCAP 85.04 output data and Modified IONCAP output data.

SEP 1987

SSN = 97

FORT COLLINS TO MIRAI60, IBARAKI, JAPAN AZIMUTHS N. MI. KM
 40.48 N 105.00 W - 36.37 N 140.60 E 312.27 44.18 4939.9 9148.0
 MINIMUM ANGLE 0.1 DEGREES

ITS- 1 ANTENNA PACKAGE

XMITR 2.0 TO 30.0 VER MONOPOLE H 0.00 L -0.50 A 0.0 OFF AZ 0.0
 RCVR 2.0 TO 30.0 VER MONOPOLE H 0.00 L 4.50 A 0.0 OFF AZ 0.0
 POWER = 7.100 MW 3 MHz NOISE = -145.0 DBM REQ. REL = 90 REQ SNR = 73.0

YE = 20.0 HE = 110.0 HS = 110.0

LAT	LONG	LMT	UT	E	F1	Y1	H1	FH/2	F2Z	Y2	H2	ES	MED	H1	M3000	MPF2	RAI	ZEN	ZMAX	MAIL
46.3N	114.6W	17.4	1.0	1.98	0.0	0.0	0.0	0.7	7.7	94.9	322.9	1.0	1.7	2.9	3.02	318.0	3.5	83.4	61.8	53.6N
51.0N	126.3W	16.4	1.0	3.22	0.0	0.0	0.0	0.7	7.6	109.7	335.7	1.5	1.8	2.9	2.98	324.8	3.4	79.1	63.3	56.1N
55.7N	164.9W	14.0	1.0	3.85	5.1	48.9	195.6	0.6	8.7	127.1	314.0	2.0	2.2	2.9	2.89	339.8	3.1	63.6	63.3	53.0N
47.9N	159.3E	11.6	1.0	3.79	5.0	49.5	197.8	0.6	8.7	127.1	314.0	2.3	2.8	4.0	2.95	329.5	2.5	51.0	57.9	39.7N
42.5N	149.1E	10.9	1.0	3.85	5.1	48.9	195.6	0.6	9.2	127.2	308.1	2.3	2.9	4.4	2.99	321.9	2.4	47.6	54.8	33.1N

FREQ = 6.1 MHz UT = 1.0

TIME DEL	5 F2	6 F2	7 F2	5 F2
33.353	33.615	34.106	33.353	
16.021	18.239	20.855	16.021	
345.090	310.620	295.042	345.090	
301.053	308.371	314.502	301.053	
0.292	0.272	0.079	0.292	
-11.672	-11.381	-11.155	-11.672	
25.454	23.216	21.001		
128.128	128.196	128.322		
-127.990	-135.599	-141.957	-127.150	
-262.000	-269.000	-275.000	-261.000	
-102.638	-109.956	-116.088	-101.670	
1.000	1.000	1.000	1.000	
1000.000	1000.000	1000.000	187.604	
0.000	0.000	0.000	0.000	
0.000	0.000	0.000	0.000	
10.625	11.811	13.149	10.874	
9.423	8.929	8.428	9.311	
-159	5. POWER =	-261		
SIGNAL =	14.2	9.9	6.8	5.0
NOISE =	9.0	-159.9	7.0	1.5
RELIAB =	13.0	-101.7	12.9	3.0
SPROB =	0.0	0.0	0.0	0.0

Figure 2a. Sample of IONCAP 85.04 output data obtained with the input file of Figure 1. The first data column labelled 5.F2 refers to the most reliable of the lowest-order (in this case, 5-hop) regular (non sporadic E) modes, and to the signal strength and reliability properties of the sum of all propagating 5-hop modes. Similar data are given for 6- and 7-hop modes. The last column, also labelled 5.F2, refers to the most reliable of all propagating modes and to the signal strength and reliability properties of the sum of all propagating modes.

SEP 1987

SSN = 97

FORT COLLINS TO HIRASD, IBARAKI, JAPAN AZIMUTHS N MI KM
 40 68 N 105 00 W - 36 37 N 140 60 E 312 27 44 10 4939.7 9148 0
 MINIMUM ANGLE 0 1 DEGREES

ITS-1 ANTENNA PACKAGE

XMITR 2 0 TO 30 0 VER MONOPOLE H 0 00 L -0 50 A 0 0 OFF AZ 0 0
 RCVR 2 0 TO 30 0 VER MONOPOLE H 0 00 L 4 50 A 0 0 OFF AZ 0 0
 POWER = 7.100 KW 3 MHz NOISE = -145.0 DBM REQ. REL = 90 REQ SNR = 73.0

VE = 20.0 HE = 110.0 HS = 110.0

LAT	LONG	LMT	UT	E	F1	V1	M1	FH/2	F2Z	Y2	H2	ES	MED	H1	M3000	HPF2	RAT	ZEN	ZMAX	MA3L
46.3N	114.6W	17.4	1.0	1.98	0.0	0.0	0.0	0.7	7.7	94.9	322.9	1.0	1.7	2.9	3.02	318.0	3.5	89.4	61.8	53.6N
51.0N	126.3W	16.6	1.0	3.22	0.0	0.0	0.0	0.7	7.6	109.7	335.7	1.5	1.8	2.9	2.98	324.8	3.4	79.1	63.3	56.1N
55.7N	164.9W	14.0	1.0	3.85	5.1	48.9	195.6	0.6	8.7	127.1	314.0	2.0	2.2	2.9	2.89	339.8	3.1	63.6	63.3	53.0N
47.9N	159.3E	11.6	1.0	3.79	5.0	49.5	197.8	0.6	8.7	127.1	314.0	2.3	2.8	4.0	2.95	329.5	2.5	51.0	57.9	39.7N
42.5N	149.1E	10.9	1.0	3.85	5.1	48.9	195.6	0.6	9.2	127.2	308.1	2.3	2.9	4.4	2.99	321.9	2.4	47.6	54.8	33.1N

SUMMARY 9 MODES FREQ = 6.1 MHz UT = 1.0

TIME DEL	ANGLE	5 E	5 F2	6 E	6 F2	7 E	7 F2	Most REL
30 90	1.99	33.36	33.35	33.12	33.61	31.09	34.11	33.35
98 80	16.06	345.85	16.02	16.35	18.24	5.70	20.85	16.02
391 37	494.92	300.15	413.85	280.44	310.62	100.09	295.04	345.09
-9.90	0.29	0.29	-5.24	522.44	307.47	435.08	313.60	300.15
-22.90	-11.67	-11.67	-18.19	-11.62	-11.38	-15.97	-11.15	-11.67
47.70	25.41	25.45	45.10	25.10	23.22	41.95	21.00	21.00
127.46	128.13	128.13	127.49	128.07	128.20	127.52	128.32	128.32
-207.08	-321.86	-127.09	-234.27	-349.42	-134.70	-257.72	-141.06	-126.25
-352.85	-456.41	-261.64	-375.34	-483.92	-268.96	-396.57	-275.09	-260.74
-193.09	-296.64	-101.87	-215.57	-324.15	-109.19	-236.80	-115.32	-100.97
1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.42	25.00	4.74	8.63	25.00	5.92	9.48	7.26	4.97
5.21	25.00	7.80	5.22	25.00	7.31	5.24	6.81	7.70
NOISE = -159	S POWER = -260.7	/	8.3	9.0	5.2			
SIGNAL = 2 B	5.0	1.7						
NOISE = 9.7	-159.8	6.0	/	1.5	5.3	1.5		
RELIAB = 12.4	-101.0	7.8						
SPROB = 0.0	0.0	0.0						

Figure 2b. Sample of Modified IONCAP output data obtained using the input file of Figure 1. Each of the data columns except for the last refers to a single mode of propagation. All propagating modes are represented; these can be up to 20 of them. The last column lists the most reliable of all the modes, re-states some of the characteristics of that mode, and lists signal strength and reliability properties for the sum of all propagating modes.

IONOSPHERIC COMMUNICATIONS ANALYSIS AND PREDICTION PROGRAM - IONCAP VERSION 88.01

	1	2	3	4	5	6	7	8
	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890
MONTH	1987	2						
SUNSPOT	2.							
LABEL	TEST CIRCUIT							
CIRCUIT	32.60N	83.60W	42.50N	71.60W			0	
SYSTEM	1.	145.	.001	90.	45.	30.	3.0	
TIME	16	16	1	1				
METHOD	25							
ANTENNA	1	12	.01	10.				
ANTENNA	2	2	.03	2.		2.		
FREQUENCY	11.4	15.0						
EXECUTE								
QUIT								

Figure 3. Data file used to demonstrate elimination of spurious Method 25 data in the Modified IONCAP output data.

METHOD 25 IONCAP 85.04 PAGE 1

FEB 1987 SSN = 2

TEST CIRCUIT

32 60 N 83 60 W - 42 50 N 71 60 W 40 32 227 68 N. MI. KM

MINIMUM ANGLE 0.0 DEGREES 822.7 1523.5

ITS- 1 ANTENNA PACKAGE

XMITR 2 0 TO 30 0 CONST. GAIN H 0 00 L 0 00 A 0 0 OFF AZ 0 0

RCVR 2 0 TO 30 0 VER MONOPOLE H 0 00 L 2 00 A 0 0 OFF AZ 0 0

POWER = 1.000 KW 3 MHz NOISE = -145.0 DBW REG. REL = .90 REQ. SNR = 45.0

YE = 20.0 HE = 110.0 HS = 110.0

LAT LONG LMT UT E F1 Y1 H1 FH/2 F2Z Y2 H2 E8 MED HI M3000 HPF2 RAT ZEN ZMAX MAGL

37.7N 78.0W 10.8 16.0 3.12 3.9 19.5 168.7 0.7 6.0 80.1 229.3 1.4 2.0 2.7 3.47 253.7 2.9 57.5 69.1 49.0N

FREQ = 11.4 MHz UT = 16.0

TIME DEL.	1 F1	1 E	1 F1	1 ES	2 ES	1 F1
ANGLE	5.400	5.358	5.400	5.175	5.331	5.400
VIR. HITE	13.294	12.034	13.294	4.712	14.261	13.294
TRAN. LOSS	233.293	214.475	233.293	110.000	110.000	233.293
T. GAIN	153.402	178.744	153.402	175.418	1317.068	153.402
R. GAIN	0.000	0.000	0.000	0.000	0.000	0.000
ABSORB	-14.472	-14.754	-14.472	-18.866	-14.294	-14.472
FS. LOSS	10.046	10.657	10.046	13.580	9.612	
FIELD ST.	117.774	117.706	117.774	117.403	117.661	
SIG. POW.	23.298	-5.652	19.408	1.787	-1144.436	24.811
SNR	-121.000	-148.744	-123.402	-143.418	-1287.068	-119.000
MODE PROB	46.856	19.903	45.245	23.230	-1118.420	48.844
R. PWRO	0.686	0.986	0.686	0.304	0.093	0.686
RELIAB	1000.000	1000.000	1000.000	1000.000	1000.000	8.860
SERV PROB	0.583	0.113	0.506	0.046	0.000	0.651
SIG LOW	0.000	0.001	0.001	0.001	0.001	0.000
SIG UP	8.955	25.000	18.278	25.000	25.000	10.660
NOISE	7.967	25.000	8.433	14.062	25.000	8.385
SIGNAL	-168	S. POWER = -119				
NOISE	3.0	6.4	2.3	3.3	0.7	
RELIAB	8.8	-168.6	6.9	2.7	1.1	
SPROB	12.2	48.8	12.7			
	0.0	0.0	0.0			

Figure 4a. Sample of IONCAP 85.04 output data obtained with the input file of Figure 3. In this situation the only regular (non sporadic E) propagating modes are 1E (LO ray), 1E (HI ray), and 1F1. The first column of mode data contains data on the most reliable 1-hop mode. The second and third columns would normally contain data on 2-hop and 3-hop modes, respectively. In this case, however, those modes don't exist, and in their places spurious data from the 1-hop calculations appears.

METHOD 23 IONCAP 88.01 PAGE 1

FEB 1987 SSN = 2

TEST CIRCUIT

32 60 N 83 60 W - 42 50 N 71 60 W 40 32 227 68 N MI KM

MINIMUM ANGLE 0 0 DEGREES 822.7 1523.5

ITS- 1 ANTENNA PACKAGE

XMTR 2 0 TO 30 0 CONST. GAIN H 0 00 L 0 00 A 0 0 OFF A2 0 0

RCVR 2 0 TO 30 0 VER MONOPOLE H 0 00 L 2 00 A 0 0 OFF A2 0 0

POWER = 1.000 KW 3 MHz NOISE = -143.0 DBW REG. REL = 90 REG. SNR = 45.0

YE = 20.0 HE = 110.0 HS = 110.0

LAT LONG LMT UT E F1 Y1 H1 FH/2 F2Z Y2 H2 ES MED HI M3000 HPF2 RAT ZEN ZMAX MAGL

37.7N 78.0W 10.8 16.0 3.12 3.9 19.5 168.7 0.7 6.0 80.1 229.3 1.4 2.0 2.7 3.47 253.7 2.9 57.5 69.1 49.0N

SUMMARY 5 MODES FREQ = 11.4 MHz UT = 16.0

	1 E	1 E	1 F1	1 ES	2 ES	Most REL
TIME DEL.	5.16	5.36	5.40	5.17	5.33	5.40
ANGLE	4.17	12.03	13.29	4.71	14.26	13.29
VIR HITE	102.46	214.47	233.29	110.00	110.00	233.29
TRAN LOSS	156.91	178.74	153.40	175.42	1317.07	153.40
T. GAIN	0.00	0.00	0.00	0.00	0.00	0.00
R. GAIN	-19.58	-14.75	-14.47	-18.87	-14.29	-14.47
ABSORB	15.50	10.46	10.05	13.58	9.61	
FS. LOSS	117.39	117.71	117.77	117.40	117.66	
FIELD ST.	21.01	-5.65	19.41	1.79	-1144.44	23.33
SIG. POW.	-126.91	-148.74	-123.40	-145.42	-1287.07	-121.77
SNR	41.41	19.57	44.92	22.90	-1118.75	46.55
MODE PROP	0.99	0.99	0.69	0.30	0.09	0.69
R. PURQ	1000.00	1000.00	1000.00	1000.00	1000.00	8.96
RELIAB	0.33	0.11	0.30	0.05	0.00	0.37
SERV PROB	0.00	0.00	0.00	0.00	0.00	0.00
SIG LOW	4.20	25.00	18.28	25.00	25.00	8.97
SIG UP	4.22	25.00	8.43	14.03	25.00	8.02
NOISE =	-168	5. POWER =	-121.8			
SIGNAL =	3.3	0.7	3.0	6.4	4.2	
2 3	9.4	-168.3	5.5	4.6	2.0	
NOISE =	12.4	46.5	10.5			
RELIAB =	0.0	0.0	0.0			
SPROB =						

Figure 4b. Sample of Modified IONCAP output data obtained with the input file of Figure 3. The three regular (non sporadic E) modes, 1E (LO ray), 1E (HI ray), and 1F1, are described in the first three columns of mode data, followed by two columns of sporadic E mode data and the most-reliable-mode summary data.

3rd call (for short-paths, after sporadic E mode performances have been determined):

IFLG=2
FVAL=999

4th call (for long paths):

IFLG=1
FVAL=999

2. When no mode exists which is below the MUF, subroutine INMOD is invoked to select an over-the-MUF mode, the data for which is stored by another call to ALLMODES(IFLG,FVAL), with the parameters indicating

IFLG=101 or 301 if the frequency is above the MUF, or
IFLG=102 or 302 if the frequency is below the MUF;
FVAL= number of hops

A listing of the new subroutine ALLMODES.FOR is attached as section III.

B. Addition of an Antenna-independent "All Modes" Output (METHOD 125) for Use with IONANT

In addition to changing the contents and format of the Method 25 All Modes data output, a new provision has been added in the Modified IONCAP to provide information which is similar to the Method 25 data, but excludes the effect of antenna gains. This method, termed Method 125, is useful in studying area coverage as a function of antenna properties, because the ionospheric data need be calculated only once. The data are in fact designed specifically for use with the the VOA/NRL IONANT program. Data for each test point are stored in a separate file with the name of the test point.

Some confusion may arise because the outputs from both Method 25 and Method 125 are termed "All Modes" outputs. In addition, the Method 125 All Modes data are generated in a subroutine named ALLMODES, and the variables containing that data are contained in the COMMON block named /ALLMODE/.

Method 125 is selected by including "125" in columns 21-25 of the METHOD input card. When METHOD 125 is selected, any entry in the usual METHOD entry location, columns 11-15, is ignored.

Method 125 creates a separate output file for each path, and the file is given the name of that path (e.g., tangr12345). Data are written in unformatted form. Each Method 125 output file contains the following data, each item identified below by its FORTRAN name and meaning:

Path Data:

```
( TLATD  = absolute val. of xmtr latitude [deg]
( ITLAT  = N or S, for North or South xmtr latitude
( TLONGD = absolute val. of xmtr longitude [deg]
( ITLONG = E or W, for East or West xmtr longitude
( RLATD  = absolute val. of rcvr latitude [deg]
( IRLAT  = N or S, for North or South rcvr latitude
( RLONGD = absolute val. of rcvr longitude [deg]
( IRLONG = E or W, for East or West rcvr longitude
( BTRD   = bearing [deg] from xmtr to rcvr
( GCDKM  = great circle path length [km]
( RSN    = required signal/noise ratio [dB]
( LUF    = LUF probability
( NYEAR  = calendar year minus 1900
```

Mode Data:

Written at beginning and
at each SSN change in SSN
within SSN loop:

SSN = Sunspot number

Written at beginning and
at each change in Year
within Year loop:

NYEAR = calendar year minus 1900

Written at beginning and
at each hour change
inside Hour loop:

GMT = time (GMT)

```
( NMOD    = number of propagating modes
( FREQ    = frequency
( For i = 1 to NMOD:
Written for all ( ZTLOSS(i) = propagation loss [dB] of mode i
combinations of SSN, ( XB(i) = take-off angle for mode i
Month, Hour, and Freq- ( ZTLOW(i) = lower decile transmission loss
[ dB] for mode i
uency values specified ( ZTLHGH(i) = upper decile transmission loss
[ dB] for mode i
in IONCAP input deck: ( RCNSE = Receiver noise [dB]
( DU = upper decile of receiver noise [dB]
( DL = lower decile of receiver noise [dB]
```

Method 125 is implemented by statements from subroutines ESMOD, ESREG, GENOIS, HFMUFS, AND LUFFY. These statements open the output file, write output data, omit the regular output data, and direct antenna gain subroutines not to be called. The logical unit for Method 125 output is designated m100 in the Modified IONCAP. In place of the usual output data written to logical unit LUO, data on the number of modes for each sunspot number, month, hour, and frequency are written into LUO, the usual output data logical unit. This feature, incorporated into subroutine HFMUFS, could be omitted without degrading the usefulness of the program.

C. Incorporation of an Updated Noise Model into IONCAP

A new noise model for HF systems has been developed by A. D. Spaulding and F. G. Stewart of the Institute for Telecommunication Sciences, National Telecommunications and Information Administration, U. S. Department of Commerce, Boulder, Co 80303-3328. This model, which evolved over a period of more than two decades, is described in NTIA Report 87-212 (January 1987). The abstract is quoted here:

"This report presents an updated and improved noise model designed for use in the HF propagation prediction program, IONCAP. The model has, however, much more general applicability, since the frequency range 10 kHz to 30 MHz is covered. The report gives the history, as near as can be determined, of the existing noise routines, and then develops the updated model based on current information. The three noise sources - atmospheric, man-made, and galactic are treated and a more appropriate means of combining these three sources is developed. Examples of the use of the improved model in IONCAP are included and comparisons made with the existing model.

The changes essential to applying the improved noise model appear in a new version of subroutine GENOIS. This version, with only such changes as required to accomplish modifications discussed elsewhere in this report, was incorporated in the Modified IONCAP. The NTIA report also included versions of subroutines ANOIS1, NOISY, and GENFAM, which were not substituted into the Modified IONCAP. Copies of the FORTRAN versions of GENOIS, ANOIS1, NOISY, and GENFAM contained in the NTIA report are included as Section IV of this report.

The new model comprises the following three major changes:

1. A change to the new atmospheric noise model described in CCIR Report 322-3 (1986), the details of which are contained in the report Atmospheric Radio Noise: Worldwide Levels and Other Characteristics, (NTIA/ITS Report 85-173, NTIS Order No. PB85-212942), by A. D. Spaulding and J. S. Washburn (1985).

2. A change to the updated man-made noise model published as CCIR Report 258-4 (1982), incorporating the data from the report Man-made Radio Noise, Part 1: Estimates for Business, Residential, and Rural Areas, (Office of Telecommunications Report 74-83, NTIS Order No. COM75-10798/AS), by A. D. Spaulding and R. T. Disney (1974).

3. Inclusion of a new way of summing noise contributions. IONCAP 85.04 considers noise of three types: atmospheric, galactic, and man-made, and each is represented by a log-normal distribution of amplitudes. In the old version of subroutine GENOIS the median value of the total is calculated from a simple sum of the median values. In the updated GENOIS the calculation is made in a more complicated, but more accurate, way. In this procedure, the summed noise distribution, which is not log-normal, is represented by the log-normal

Table II. Difference between the new and old values of man-made and galactic noise. (From NTIA Report 87-212 by A. D. Spaulding and F. G. Stewart).

Noise Difference (Old - New) [dB]					
Frequency	Area Type				
	Business	Residential	Rural	Quiet Rural	Galactic
2 MHz	-15.5	-8.8	-2.1	+0.1	2.2
4	-15.4	-8.7	-2.0	-0.1	1.9
6	-15.3	-8.6	-1.9	-0.2	1.7
8	-15.3	-8.6	-1.9	-0.3	1.6
10	-15.3	-8.6	-1.9	-0.4	1.5
12	-15.2	-8.5	-1.8	-0.4	1.4
14	-15.2	-8.5	-1.8	-0.4	1.4
16	-15.2	-8.5	-1.8	-0.5	1.3
18	-15.2	-8.5	-1.8	-0.5	1.2
20	-15.2	-8.5	-1.8	-0.5	1.2
22	-15.2	-8.5	-1.8	-0.6	1.2
24	-15.1	-8.4	-1.7	-0.6	1.1
26	-15.1	-8.4	-1.7	-0.6	1.1
28	-15.1	-8.4	-1.7	-0.6	1.1
30	-15.1	-8.4	-1.7	-0.6	1.0

distribution which makes a best fit to the actual distribution. The change is significant in cases where two or more of the noise contributions are of approximately equal magnitude. The calculations are rather complicated, but are given in detailed form in the NTIA report.

The results from IONCAP are substantially changed by the new noise model. The effect of the new noise measurements is illustrated in the NTIA Report 87-212 by a table, reproduced here as Table II, giving the difference between new and old values of man-made and galactic noise values. The report also includes sample IONCAP Method 23 output to illustrate the differences in Signal, Noise, and S/N caused by the new data and calculational methods. The differences caused by the new technique for summing noise are significant but apparently generally not as large as those caused by the change in data. They are also illustrated in the report by Method 23 output sheets, which are calculated using the new data and both the new and the old calculational techniques.

The documentation of the Updated Noise Model provided by Spaulding and Stewart includes listings of new versions of the IONCAP subroutines GENOIS, ANOIS1, NOISY, and GENFAM, which are reproduced here as Appendix B. The essential changes are in the long-term data base and in GENOIS, both of which have been incorporated into the Modified IONCAP program. The other three subroutines, whose listings differ slightly from their forms in IONCAP 85.04, appear to contain no computational differences which would affect the output data.

D. A Change in Output of System Performance Table (Method 20) Quantities

This modification affects the output of six system performance variables which are calculated in Methods 16 - 23. The quantities are those identified in the tabulations as V HITE, LOSS, DBU, S DBW, SNR, AND RPWRG. In IONCAP 85.04 these quantities are floating point variables whose values have been truncated to integer values before writing to output. In the Modified IONCAP, these quantities have been rounded to the nearest integer. They thus more accurately approximate the calculated values, and can differ from the values in IONCAP 85.04 by as much as unity. In addition, the output format for five of the quantities has been changed from F4.0 to I4 (i.e., a decimal point no longer occupies one of the four spaces allotted to each quantity), which prevents overflows when a quantity is -100 or less, or 1000 or greater.

These modifications were made in subroutine OUTBOD. The FORTRAN variables VHIGH, DBLOS, DBU, DBW, SNDB, and SNPR correspond, respectively, to the tabulated values designated V HITE, LOSS, DBU, S DBW, SNR, and RPWRG. The variables whose output format was changed to I4 are VHIGH, DBLOS, DBU, SNDB, and SNPR.

Figure 5 contains a listing a data file used to depict the change in output. Figures 6a and 6b show the outputs from IONCAP 85.04 and from the Modified IONCAP, respectively.

[illegible][illegible]

Figure 5. Input data file used to illustrate the differences between IONCAP 85.04 and Modified IONCAP with Method 20 output data. Both programs were run using the long-term data base which includes the updated noise model.

METHOD 20 IONCAP 85.04 PAGE 1
 JUN 1988 SSN = 120
 UTICA, NY to PETERSON AFB, CO AZIMUTHS N MI. KM
 43.08 N 75.14 W - 38.56 N 104.38 W 268.39 69.12 1348.7 2497.6
 MINIMUM ANGLE 0.1 DEGREES
 ITS- 1 ANTENNA PACKAGE
 XMTR 2.0 TO 30.0 VER MONOPOLE H 0.00 L 10.00 A 0.0 OFF AZ 0.0
 RCVR 2.0 TO 30.0 VER MONOPOLE H 0.00 L 10.00 A 0.0 OFF AZ 0.0
 POWER = 1.000 KW 3 MHZ NOISE = -148.0 DBW REQ. REL = 90 REQ. SNR = 12.0
 MULTIPATH POWER TOLERANCE = 10.0 DB MULTIPATH DELAY TOLERANCE = 5.000 MS
 UT MUF

16.0	19.0	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
1F2	2 E	2 E	2ES	2F1	2F2	2F1	2F2	1F2	1F2	2ES	2ES	2ES	MODE
16.2	4.4	4.8	7.1	7.1	31.8	17.4	15.6	16.2	16.2	7.1	7.1	7.1	ANGLE
9.3	8.4	8.5	8.5	8.5	10.5	9.0	9.3	9.3	9.3	8.5	8.5	8.5	DELAY
521.	79.	84.	110.	110.	446.	235.	507.	521.	521.	110.	110.	110.	V HITE
0.14	1.00	1.00	0.98	0.96	0.96	1.00	0.56	0.26	0.08	0.10	0.02	0.02	F DAYS
153.	440.	408.	280.	226.	169.	175.	147.	149.	158.	192.	222.	222.	LOSS
16.	***	***	***	-41.	-7.	-8.	18.	15.	7.	-23.	-50.	-50.	DBU
-118	-410	-377	-250	-168	-135	-140	-113	-116	-125	-162	-192	-192	S DBW
-170	-152	-153	-156	-159	-161	-164	-166	-168	-170	-173	-173	-173	N DBW
51.	***	***	-94.	-10.	25.	24.	53.	52.	45.	11.	-17.	-17.	SNR
-13.	282.	248.	118.	47.	13.	8.	-17.	-14.	-7.	27.	54.	54.	RPWRG
0.97	0.00	0.00	0.00	0.01	0.74	0.77	0.99	0.98	0.95	0.48	0.08	0.08	REL
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MPROB
0.63	0.00	0.00	0.00	0.06	0.33	0.35	0.71	0.64	0.57	0.19	0.04	0.04	S PRB
25.	10.	10.	10.	25.	25.	19.	23.	25.	25.	25.	25.	25.	SIG LW
15.	1.	1.	1.	8.	10.	12.	8.	13.	20.	21.	25.	25.	SIG UP
16.	***	***	***	-41.	-7.	-8.	18.	15.	7.	-23.	-50.	-50.	VHFDU
25.	10.	10.	10.	25.	25.	19.	23.	25.	25.	25.	25.	25.	VHF LW
15.	1.	1.	1.	8.	10.	12.	8.	13.	20.	21.	25.	25.	VHF UP
F	E	E	ES	ES	F2	F1	F2	F2	F	F	ES	ES	VHFMOD
26.	12.	12.	12.	26.	26.	20.	24.	26.	26.	26.	26.	26.	SNR LW
17.	9.	9.	9.	12.	14.	15.	12.	16.	22.	23.	26.	26.	SNR UP

Figure 6a. IONCAP 85.04 Method 20 output data obtained with the input data of Figure 5.

JUN 1988 SSN = 120.

UTICA, NY to PETERSON AFB, CO AZIMUTHS N MI. KM
 43.08 N 75.14 W - 38.56 N 104.38 W 268.39 69.02 1348.7 2497.6

MINIMUM ANGLE 0.1 DEGREES

ITS- 1 ANTENNA PACKAGE

XMTR 2.0 TO 30.0 VER MONOPOLE H 0.00 L 10.00 A 0.0 OFF AZ 0.0
 RCVR 2.0 TO 30.0 VER MONOPOLE H 0.00 L 10.00 A 0.0 OFF AZ 0.0
 POWER = 1.000 KW 3 MHZ NOISE = -130.0 DBW REG. REL = 90 REQ. SNR = 12.0
 MULTIPATH POWER TOLERANCE = 10.0 DB MULTIPATH DELAY TOLERANCE = 5.000 MS

UT MUF

16.0	19.0	2.0	3.0	5.0	7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	FREQ
1F2	2 E	2 E	2ES	2ES	2F1	1F2	1F2	1F2	2ES	2ES	2ES	2ES	MODE
16.2	4.4	4.8	7.1	7.1	31.8	17.4	15.6	16.2	16.2	7.1	7.1	7.1	ANGLE
9.3	8.4	8.5	8.5	8.5	10.5	9.0	9.3	9.3	9.3	8.5	8.5	8.5	DELAY
521	79	84	110	110	446	235	507	521	521	110	110	110	V HITE
0.14	1.00	1.00	0.98	0.96	0.96	1.00	0.56	0.26	0.08	0.10	0.02	0.02	F DAYS
153	440	408	280	226	169	175	147	149	158	192	222	222	LOSS
13	-270	-241	-118	-41	-7	-9	18	12	5	-23	-50	-50	DBU
-121	-410	-378	-250	-169	-137	-142	-114	-119	-127	-162	-192	-192	S DBW
-171	-154	-154	-157	-160	-162	-165	-168	-170	-172	-175	-177	-177	N DBW
51	-256	-223	-93	-9	26	23	54	51	46	13	-15	-15	SNR
-13	279	246	116	46	11	7	-19	-14	-8	25	52	52	RPWRG
0.97	0.00	0.00	0.00	0.02	0.76	0.78	0.99	0.98	0.95	0.52	0.10	0.10	REL
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MPROB
0.61	0.00	0.00	0.00	0.07	0.32	0.31	0.71	0.64	0.57	0.22	0.05	0.05	S PRB
25	10	10	10	25	25	18	23	25	25	25	25	25	SIG LW
15	1	1	1	8	10	12	8	14	20	21	25	25	SIG UP
13	***	***	***	***	-41	-7	-9	18	12	5	-23	-50	VHFDDBU
25	10	10	10	25	25	18	23	25	25	25	25	25	VHF LW
15	1	1	1	8	10	12	8	14	20	21	25	25	VHF UP
F	E	E	ES	ES	F2	F1	F2	F2	F	F	ES	ES	VHFMOD
26	11	11	12	25	25	19	23	26	26	26	26	26	SNR LW
18	10	10	10	13	14	15	12	16	22	24	27	27	SNR UP

Figure 6b. Modified IONCAP Method 20 output data obtained with the input data of Figure 5. Because of the format changes, DBU and SNR quantities which exceed 99 are printed, where in IONCAP 85.04 overflow stars appear. Because of differences in summing the contributions of different modes, and because of rounding instead of truncating the results, most of the performance quantities produced by the Modified IONCAP show some differences from those produced by IONCAP 85.04.

E. A Change in Procedure for Summing Signal Levels in RELBIL

While signal and noise levels are frequently expressed in logarithmic form, summing several sources of signal or noise requires linear expressions. When the quantities vary over a wide range, transitions between the two forms are at risk of computational overflow because of machine-dependent limitations on the size of permissible numbers. Such overflows sometimes occurred in subroutine RELBIL when IONCAP 85.04 was run on the NRL Space Sciences Division VAX computer, which doesn't allow numbers greater than $1.0E+38$. In this subroutine, each of the logarithmic quantities SIGPOW(IM) - TLOW(IM), SIGPOW(IM), SIGPOW(IM) - TLHG(IM), and FLDST(IM) is summed over all propagating modes (numbered by IM), producing the sums XDSTLW, XSIGS, SDSUP, and XFLD, respectively. In the modified IONCAP, each contribution is normalized to the value of the maximum contribution for the quantity to which it contributes. This change prevents an overflow condition from occurring for certain situations involving very large signals. The effect of this normalization is removed after the summation has been completed and the sums re-converted to logarithmic form.

F. Re-instatement of Long-path System Absorption Values

Subroutine SIGDIS calls subroutine SYSSY(X1, X2, X3, X4, X5, X6, X7, X8, X9), which picks the correct system absorption loss out of the data base. The third parameter is used to declare whether the path is short (X3=2) or long (X3=5). In IONCAP 85.04 variable X3 was fixed, apparently inadvertently, at 2. In the Modified IONCAP, two new lines have been added to SIGDIS to change X3 to 5 if the path length exceeds 2500 Km.

G. Consolidation of Subroutines for Calculating LUF and System Performance

In IONCAP 85.04, LUF values are calculated from subroutine SHTLUF (for short paths) and GETLUF (for long paths), and the quantitative performances for individual modes are calculated in LUFFY (for short paths) and LNGLUF (for long paths). Since these four subroutines have a substantial number of lines of identical coding, they have been combined into the single subroutine LUFFY(IPFLAG). The subroutine is called with a value of the variable IPFLAG depending on the desired function:

FUNCTION	IPFLAG
Short-path System Performance	100
Long-path System Performance	200
Short-path LUF	300
Long-path LUF	400

Subroutines SHTLUF, GETLUF, and LNLUF therefore do not appear in the Modified IONCAP program.

H. Restructuring of COMMON Blocks

In IONCAP 85.04, certain COMMON blocks are defined with different lengths in different subprograms. This is permissible on some computers, such as the VAX. On the NRL Cray computer, however, it is required that a given COMMON block have the same length in every subprogram in which it appears. To make the Modified IONCAP program work on the Cray, therefore, COMMON blocks /ANOIS/, /CONTRL/, /DON/, /FRQ/, /METSET/, /RAYS/, /RON/, /SON/, /TIME/, /TON/, /ZON/, /AON/, and /ALPHA/ were modified so that each has the same form in every subprogram in which it appears. COMMON blocks /OUTLAB/, /REFLX/, and /LOSX/ were modified to partially fulfill this criterion.

I. A WRITE-statement in FLOLIN Changed to Prevent Output-Conversion-Overflow Error Messages

In subroutine FLOLIN, which outputs individual lines of circuit reliability data as directed by OUTBOD, data can sometimes not be written into the data file because the number of characters exceeds the number allowed by the output format. Under this non-fatal condition, the output field is filled with asterisks and a warning message is issued. When long IONCAP runs are made, the large number of these messages sometime causes the data file or log file (if the the job is run in batch mode) to be messed up and/or inconveniently long. To prevent these error messages from being written, an IOSTAT specifier was added to the WRITE statements in FLOLIN.

J. A Change in Subroutine Variables: GEOTIM(ITIM,JT) Changed to GEOTIM(JT).

GEOTIM is a subroutine which, given the time JT (in either LMT or GMT) at the transmitter, computes (via function CNGTIM) the local mean time at each of the five ionospheric reflection points used by IONCAP. The parameter ITIM, which is read in on the TIME Control Card and which indicates whether calculations have been requested for GMT or LMT times, has been added to the /TIME/ Common Block, and thus is not required as an explicit variable in GEOTIM.

K. Additional RETURN Statements Added in SELRCR and SELTMT

A RETURN statement was added in the Modified IONCAP to subroutines SELRCR and SELTMT to terminate operation of these subroutines when an over-the-MUF mode has been calculated. This was done because that situation sometimes resulted in a fatal arithmetic (dividing by zero) error. It would be possible to devise a more sophisticated way to alleviate this difficulty.

L. Change of Version Number

In IONCAP 85.04 the version number variable VERSN is set to 85.04 in both Program IONCAP.FOR and the block data module BLKDAT.FOR. In the Modified IONCAP the variable is set to 88.01 in BLKDAT.FOR, and the duplicate statement in IONCAP.FOR was removed.

M. Format Changes to Accomodate Line Printers with 132 Characters/Line

In IONCAP 85.04 the Vertical-incidence ionogram format was designed for a 135-column line printer. In the Modified IONCAP a slight modification was made in subroutine IONPLT.FOR to permit the ionogram to be displayed on a 132-column printer.

For the same reason, the Modified IONCAP includes a format change in subroutine OUTANT. In the FORMAT statement which controls output of the antenna gain pattern, the elevation angle scale and legend on the right-hand side are omitted so that the output can be written in 131 columns rather than 136.

The Modified IONCAP includes a similar change in subroutine OUTPAR, which includes FORMAT statements which controls the output of data on each ionospheric reflection point. In IONCAP 85.04, the format for this output required a printer with 135 characters per line. In the Modified IONCAP the FORMAT statements were changed to permit use of a printer with 132 characters per line.

N. A Branching Criterion Changed in LECDEN

Subroutine LECDEN includes a branching point whose outcome depends on the relative heights of two electron density profiles. If the quantities being compared are close, the outcome can depend on the precision of the computer. This circumstance apparently caused the sample input data (from the ITIS IONCAP 78.01 User's Manual), when calculated with the NRL SSDVAX computer, to yield results different from the ITIS sample output data, which had been calculated with an HP1000 computer. The addition of a small increment (0.00001) to one of the quantities being tested changed the results so that the NRL results agree with the sample results.

O. Removal of Documentation from Source Code

In IONCAP 85.04, the main IONCAP program contained about three pages of information describing the program, its purposes and development. When it was decided to adapt the program to a desk-top computer at NRL, it became necessary to shorten the source code as much as possible. Thus those comments were removed and retained as a separate file named IONCAP.DOC. The D-comment statement

```
D      INCLUDE 'IONCAP.DOC/LIST'
```

was then inserted into IONCAP so that when the source code is compiled, the descriptive information may be included in the listing, if desired, by adding the command qualifier /D_LINES.

P. Subroutine MAKDAT.FOR for Generating Standard Antenna Patterns

VOA requirements for propagation predictions over a wide area resulted in a need for antenna patterns other than those provided in IONCAP 85.04. Separate transmitter and receiver antenna patterns were thus adopted by VOA as standards. A FORTRAN program MAKDAT.FOR was also provided by VOA to generate a file named TAPE26, which contains the antenna pattern data required by IONCAP. The following two paragraphs briefly describe the standard antenna patterns, and a listing of MAKDAT.FOR is provided in section VI.

The standard receiver pattern is assumed to be the equivalent of a 3-foot whip with a ground plane of sixty 3-foot radials. According to information provided by VOA, the elevation radiation pattern of this azimuthally isotropic antenna can be derived from measured and calculated data published by the U.S. Army Signal Radio Propagation Agency. The antenna pattern is illustrated in Figure 7, and tabulated in Table 3.

The standard transmitting antenna is assumed to be azimuthally isotropic, with an elevation dependence derived from values tabulated below. The gains for non-integral elevation angles below 5 degrees are determined by linear interpolation.

<u>Elevation angle [Degrees]</u>	<u>Gain [dB]</u>
1	-26
2	5
3	10
4	15
5	17
5-90	17

RELATIVE SPACE PATTERNS

15' WHIP ANTENNA

———— RADIO PROPAGATION UNIT
———— TECHNICAL REPORT NO. 2
----- OHIO STATE..

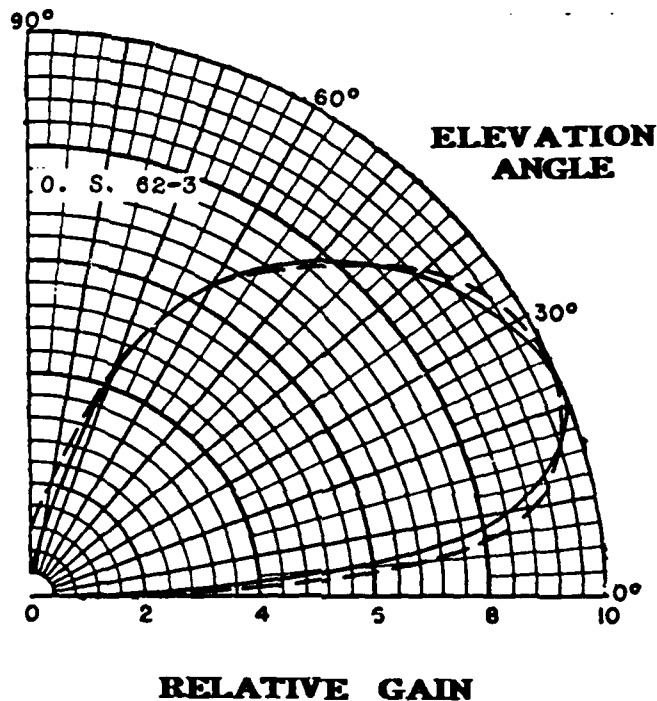


Figure 7. Receiver antenna pattern adopted as a standard by VOA. The figure displays the dependence of gain on elevation angle of the incoming HF wave, derived from measurements made at 2.03MHz. The gain is isotropic in azimuthal angle.

TABLE 3. Tabulated Values of Gain as a Function of Elevation Angle for the Standard VOA Receiver Antenna. At Elevation Angles Between the Values Shown, Linear Interpolation Shall be Used.

<u>ELEVATION ANGLE</u>	<u>GAIN [dBi]</u>	<u>ELEVATION ANGLE</u>	<u>GAIN [dBi]</u>
0°	-20.0	48°	- 2.0
10	-14.0	49°	- 2.1
20	-11.0	50°	- 2.3
30	- 7.6	51°	- 2.4
40	- 5.4	52°	- 2.6
50	- 4.0	53°	- 2.7
60	- 3.2	54°	- 2.9
70	- 2.5	55°	- 3.1
80	- 1.8	56°	- 3.2
90	- 1.6	57°	- 3.4
100	- 1.3	58°	- 3.6
110	- 1.1	59°	- 3.7
120	- 0.9	60°	- 3.9
130	- 0.6	61°	- 4.2
140	- 0.5	62°	- 4.4
150	- 0.4	63°	- 4.7
160	- 0.2	64°	- 5.0
170	- 0.1	65°	- 5.4
180	- 0.0	66°	- 5.7
to		67°	- 6.0
250	- 0.0	68°	- 6.4
260	- 0.1	69°	- 6.7
270	- 0.2	70°	- 7.1
280	- 0.2	71°	- 7.5
290	- 0.2	72°	- 7.9
300	- 0.3	73°	- 8.4
310	- 0.3	74°	- 8.8
320	- 0.4	75°	- 9.3
330	- 0.5	76°	- 9.8
340	- 0.5	77°	-10.4
350	- 0.6	78°	-10.9
360	- 0.7	79°	-11.4
370	- 0.8	80°	-12.0
380	- 0.8	81°	-12.6
390	- 0.9	82°	-13.2
400	- 1.0	83°	-13.9
410	- 1.1	84°	-14.6
420	- 1.2	85°	-15.4
430	- 1.4	86°	-16.2
440	- 1.5	87°	-17.2
450	- 1.6	88°	-18.2
460	- 1.8	89°	-19.6
470	- 1.9	90°	-21.9

III. SOME AIDS TO IONCAP DOCUMENTATION

The computer work for this report was done on the NRL Space Sciences Division VAX SSDVAX. The IONCAP 85.04 source code modules are stored in the directory USD1:[VOALIB.IONCAP.SOURCE.ORIG], and the Modified IONCAP source code modules are stored in the directory USD1:[VOALIB.NEWCAP.SOURCE]. Concatenated source codes are contained in the files

USD1:[VOALIB.IONCAP.SOURCE]ALL.FOR (IONCAP 85.04)
USD1:[DAEHLER]ALLNEW.FOR (Modified IONCAP).

Executable versions of the IONCAP programs are contained in the files

USD1:[VOALIB.IONCAP]IONCAP.EXE (IONCAP 85.04)
USD1:[DAEHLER]ALLNEW.EXE (Modified IONCAP).

The original long-term data base acquired with IONCAP 85.04 is contained in the files

USD1:[VOALIB.IONCAP.SOURCE]IONCAP_LTD.ASCII;1 (ASCII version)
and USD1:[VOALIB.IONCAP]IONCAP.LTD;1 (binary version).

The long-term data base containing the Updated Noise Model is contained in the files

USD1:[VOALIB.NUNOIS]NEW_LTD.ASCII;1 (ASCII version)
and USD1:[VOALIB.IONCAP]NEW_IONCAP.LTD;1 (binary version).

When running IONCAP to obtain sample output data, the following command procedures were used:

USD1:[VOALIB]IONCAP.COM (IONCAP 85.04)
USD1:[VOALIB.IONCAP]NEWCAP.COM (Modified IONCAP).

Two charts (Figures 8 and 9) and Table 4 were created because their information was found useful in understanding the flow of calculations in IONCAP and in documenting the changes by which IONCAP 85.04 became the Modified IONCAP program. Figure 8 shows graphically all of the subprograms called by each subprogram in the Modified IONCAP program. Figure 9 attempts to show, for each subprogram, both the subprograms which are called by, and which subprograms call, that subprogram.

Table 4 is a listing of the information from which Figures 8 and 9 were created. The data were extracted from the concatenated version of the Modified IONCAP source code (USD1:[DAEHLER]ALLNEW.FOR, and the line numbers refer to lines in that file. For each subprogram, Table 4 lists:

a. The lines of ALLNEW.FOR which contain the listing of the specified subprogram;

b. Whether the specified subprogram is a program, subroutine, function, or block data;

c. The line number and subprogram name of every call to the specified subprogram;

d. The names of all subprograms called by the listed subprogram, and the line numbers of those calls.

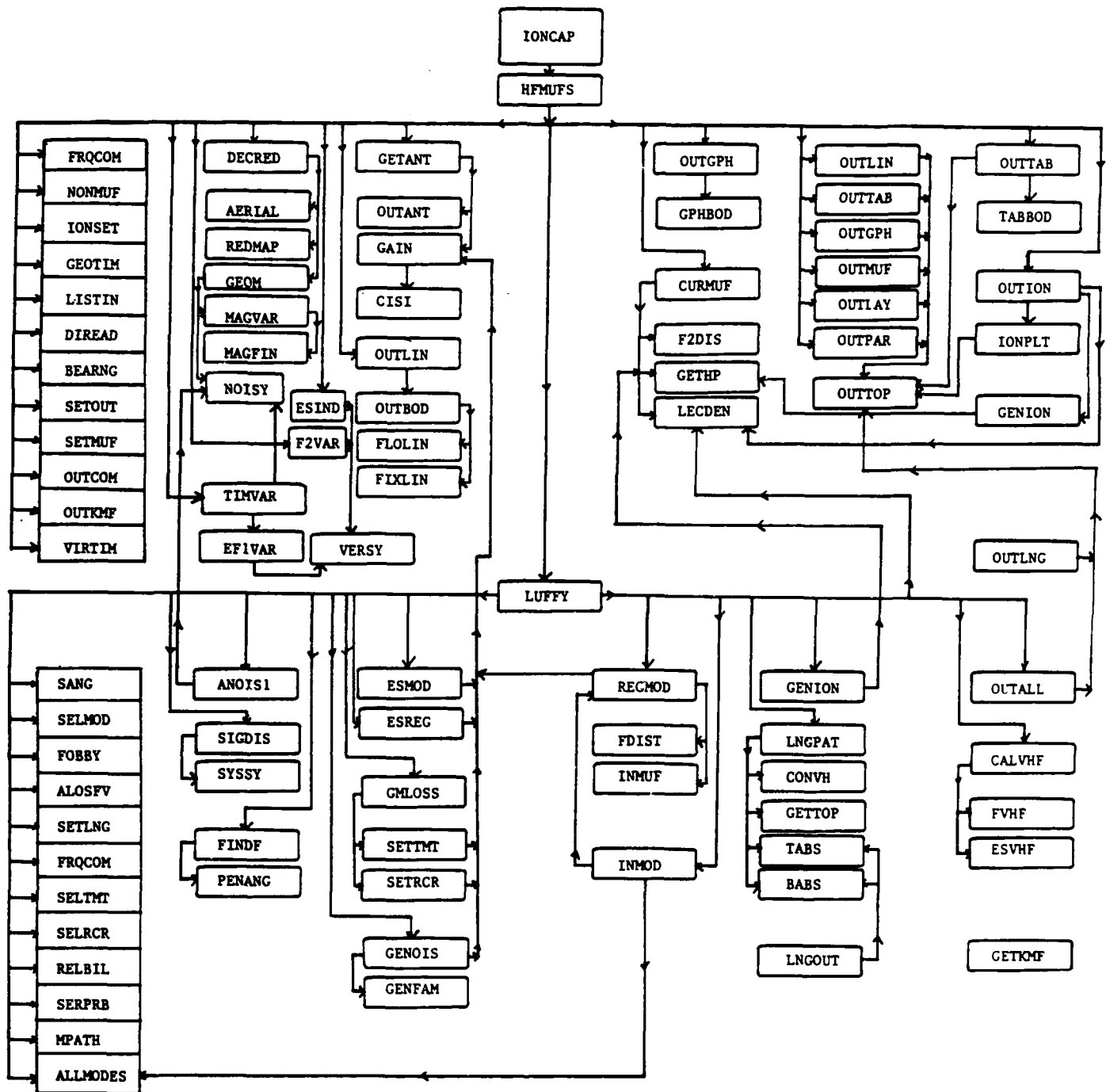


Figure 9. Direction of flow through the subprograms of the Modified IONCAP program, indicating also all of the subprograms which call a given subprogram.

Table 4: Subprograms of the Modified IONCAP program, showing the subroutines and line numbers (in ALLNEW.FOR) from which each is called, and the subprograms which each one calls. See Section III for detailed description.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.			Subroutines CALLED and the Line #
AERIAL.FOR (2-183)	SUBR.	1643	DECRED	-	NONE
ALLMODES.FOR (185-270)	SUBR.	5501	INMOD	-	NONE
		5572	INMOD	-	
		6724	LUFFY	-	
		6756	LUFFY	-	
		6770	LUFFY	-	
		6786	LUFFY	-	
ALOSFV.FOR (272-396)	SUBR.	6679	LUFFY	-	NONE
ANOIS1.FOR (398-447)	SUBR.	6696	LUFFY	-	NOISY (2)-L# 444,445
BABS.FOR (449-482)	SUBR.	6400	LNGOUT	-	NONE
		6413	LNGOUT	-	
		6492	LNGPAT	-	
BEARNG.FOR (484-526)	SUBR.		HFMUFS	-	NONE
BENDY.FOR (528-539)	FUNC.	537	BENDY	-	NONE
		1084	CURMUF	-	
		4229	GENION	-	
BLKDAT.FOR (541-784)	BLOCK DATA	NONE		-	NONE
CALVHF.FOR (786-844)	SUBR.	6809	LUFFY	-	FVHF-L# 827; ESVHF-L# 829
CISI.FOR (846-882)	SUBR.	3786	GAIN	-	NONE
		3787	GAIN	-	
		3997	GAIN	-	
		3999	GAIN	-	
		4028	GAIN	-	
		4029	GAIN	-	
CNGTIM.FOR (884-939)	FUNC.	910	CNGTIM	-	NONE
		927	CNGTIM	-	
		4663	GEOTIM	-	
		4669	GEOTIM	-	
		4679	GEOTIM	-	
		4686	GEOTIM	-	
		6389	CNGTIM	-	

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.		Subroutines CALLED and the Line #	
CONVH.FOR (941-957)	SUBR.	6472	LNGPAT	-	NONE
CURMUF.FOR (959-1315)	SUBR.	5320	HFMUFS	-	LECDEN-L# 1004; GETHP (3)-L# 1026, 1079, & 1171; F2DIS (2)- L# 1135 & 1141
DECRED.FOR (1317-1977)	SUBR.	5223	HFMUFS	-	REDMAP-L# 1537; AERIAL-L# 1643; GEOM L# 1699
DIREAD.FOR (1979-1990)	SUBR.	5220	HFMUFS	-	NONE
EF1VAR.FOR (1992-2054)	SUBR.	10400	TIMVAR	-	VERSY-L# 2017
ESIND.FOR (2056-2084)	SUBR.	5304	HFMUFS	-	VERSY-L# 2075
ESMOD.FOR (2086-2296)	SUBR.	6767	LUFFY	-	GAIN (3)-L# 2236, 2242, & 2243
ESREG.FOR (2298-2656)	SUBR.	6769	LUFFY	-	GAIN (3)-L# 2581, 2583, & 2595
ESVHF.FOR (2658-2811)	SUBR.	829	CALVHF	-	NONE
F2DIS.FOR (2813-2865)	SUBR.	1135 1141	CURMUF CURMUF	- -	NONE
F2VAR.FOR (2867-2937)	SUBR.	5301	HFMUFS	-	VERSY-L# 2883
FDIST.FOR (2941-3036)	SUBR.	8604	REGMOD	-	NONE
FINDF.FOR (3038-3254)	SUBR.	6729 6775 6777	LUFFY LUFFY LUFFY	- - -	PENANG-L# 3100
FIXLIN.FOR (3256-3280)	SUBR.	7656 7664 7669 7674 7677 7682 7687	OUTBOD OUTBOD OUTBOD OUTBOD OUTBOD OUTBOD OUTBOD	- - - - - - -	NONE

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALled in L.# & SUBR.		Subroutines CALled and the Line #	
FLOLIN.FOR (3282-3307)	SUBR.	7646	OUTBOD	-	
		7648	OUTBOD	-	
		7651	OUTBOD	-	
		7659	OUTBOD	-	
		7690	OUTBOD	-	
		7693	OUTBOD	-	
		7696	OUTBOD	-	NONE
		7699	OUTBOD	-	
		7702	OUTBOD	-	
		7705	OUTBOD	-	
		7708	OUTBOD	-	
		7711	OUTBOD	-	
		7722	OUTBOD	-	
		7725	OUTBOD	-	
FNORML.FOR (3309-3335)	FUNC.	3333	FNORML	-	
		8902	RELBIL	-	NONE
		8994	RELBIL	-	
		9319	SERPRB	-	
FOBBY.FOR (3337-3367)	SUBR.	6677	LUFFY	-	NONE
FRQCOM.FOR (3369-3467)	SUBR.	5330	HFMUFS	-	NONE
		6700	LUFFY	-	
FVHF.FOR (3469-3548)	SUBR.	827	CALVHF	-	NONE
GAIN.FOR (3550-4062)	SUBR.	2236	ESMOD	-	
		2242	ESMOD	-	
		2243	ESMOD	-	
		2581	ESREG	-	
		2583	ESREG	-	
		2595	ESREG	-	
		4395	GENOIS	-	
		4740	GETANT	-	CISI (6)-L# 3786, 3787, 3997, 3999, 4028, & 4029
		8711	REGMOD	-	
		8719	REGMOD	-	
		8722	REGMOD	-	
		9808	SETRCR	-	
		9813	SETRCR	-	
		9975	SETTMT	-	
		9981	SETTMT	-	
GENFAM.FOR (4064-4116)	SUBR.	4313	GENOIS	-	NONE
		4314	GENOIS	-	
GENION.FOR (4118-4242)	SUBR.	6675	LUFFY	-	GETHP (2)-L# 4203 & 4237
		7774	OUTION	-	
GENOIS.FOR (4244-4448)	SUBR.	6731	LUFFY	-	GENFAM (2)-L# 4313 & 4314; GAIN- L# 4395
		6773	LUFFY	-	

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.			Subroutines CALLED and the Line #
GEOM.FOR (4450-4640)	SUBR.	1699	DECRED	-	MAGVAR-L# 4618; NOISY-L# 4628
GEOTIM.FOR (4642-4689)	SUBR.	5289	HFMUFS	-	NONE
GETANT.FOR (4691-4764)	SUBR.	5234	HFMUFS	-	GAIN-L# 4740; OUTANT-L# 4762
GETHP.FOR (4766-4856)	SUBR.	1026	CURMUF	-	NONE
		1079	CURMUF	-	
		1171	CURMUF	-	
		4237	CURMUF	-	
		4203	GENION	-	
GETKMF.FOR (4858-4862)	SUBR.	NONE			NONE
		(This subroutine has not yet been developed-Method 12)			
GETTOP.FOR (4864-4916)	SUBR.	6486	LNGPAT	-	NONE
GMLLOSS.FOR (4918-4979)	SUBR.	6779	LUFFY	-	SETTMT-L# 4961; SETRCR-L# 4963
GPHBOD.FOR (4981-5165)	SUBR.	7761	OUTGPH	-	NONE
HFMUFS.FOR (5167-5445)	SUBR.	5805	IONCAP	-	LISTIN-L# 5214; DIREAD-L# 5220; DECRED-L# 5223; BEARNG (2)-L# 5233 & 5239; GETANT-L# 5234; SETOUT-L# 5237; GEOTIM-L# 5289; VIRTIM-L# 5295 TIMVAR-L# 5299; F2VAR-L# 5301; ESIND- L# 5304; OUTPAR-L# 5308; IONSET (2)- L# 5311 & 5315; OUTION-L# 5312; NOMMUF-L# 5317; CURMUF-L# 5320; FRQCOM-L# 5330; LUFFY (2)-L# 5342 & 5349; SETLUF-L# 5343; OUTLIN-L# 5356; OUTTAB-L# 5360; OUTLAY-L# 5363; OUTMUF (2)-L# 5367 & 5415; OUTGPH (2)-L# 5371 & 5420; OUTCOM-L# 5375; OUTKMF-L# 5378
INMOD.FOR (5447-5590)	SUBR.	6764	LUFFY	-	REGMOD (2)-L# 5500 & 5571; ALLMODES (2)-L# 5501 & 5572
INMUF.FOR (5592-5754)	SUBR.	8607	REGMOD	-	NONE
IONCAP.FOR (5756-5808)	PRGM.	NONE			HFMUFS-L# 5805
IONPLT.FOR (5810-5972)	SUBR.	7775	OUTION	-	OUTTOP-L# 5855

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.		Subroutines CALLED and the Line #	
IONSET.FOR (5974-6036)	SUBR.	5311	HFMUFS	-	NONE
		5315	HFMUFS	-	
LECDEN.FOR (6038-6225)	SUBR.	1004	CURMUF	-	
		6673	LUFFY	-	NONE
		7773	OUTION	-	
LISTIN.FOR (6227-6364)	SUBR.	5214	HFMUFS	-	NONE
LNGOUT.FOR (6366-6425)	SUBR. (Must of been replaced)	NONE		-	TABS (2)-L# 6399 & 6412; BABS (2)- L# 6400 & 6413
LNGPAT.FOR (6427-6568)	SUBR.	6785	LUFFY	-	CONVH-L# 6472; GETTOP-L# 6486; TABS- L# 6491; BABS-L# 6492
LUFFY.FOR (6570-6847)	SUBR.	5342	HFMUFS	-	SANG-L# 6662; SELMOD-L# 6664;LECDEN- L# 6673; GENION-L# 6675; Fobby-L# 6677; ALOSFV-L# 6679;SETLNG-L# 6683; SIGDIS-L# 6694; ANOIS1-L# 6696; FRQCOM-L# 6700;ALLMODES (4)-L# 6724, 6756, 6770, & 6786; FINDF (3)-L# 6729, 6775, & 6777; GENOIS (2)-L# 6731 & 6773; REGMOD-L# 6754; INMOD- L# 6764; ESMOD-L# 6767; ESREG-L# 6769; GMLOSS-L# 6779;SELTMT-L# 6781; SELRCR-L# 6783; LNGPAT-L# 6785; RELBIL-L# 6790; SERPRB-L# 6795; MPATH-L# 6799; OUTALL-L# 6807; CALVHF-L# 6809
		5349	HFMUFS	-	
MAGFIN.FOR (6849-6944)	SUBR.	6976	MAGVAR	-	NONE
MAGVAR.FOR (6946-6988)	SUBR.	4618	GEOM	-	MAGFIN-L# 6976
MONITR.FOR (6990-7033)	FUNC.	1446	DECRED	-	
		1449	DECRED	-	
		1843	DECRED	-	
		1948	DECRED	-	
		6246	LISTIN	-	NONE
		6282	LISTIN	-	
		6287	LISTIN	-	
		6296	LISTIN	-	
		7027	MONITR	-	
		7030	MONITR	-	
MPATH.FOR (7035-7071)	SUBR.	6799	LUFFY	-	NONE

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.		Subroutines CALLED and the Line #	
NOISY.FOR (7073-7141)	SUBR.	444	ANOIS1	-	NONE
		445	ANOIS1	-	
		4628	GEOM	-	
		10408	TIMVAR	-	
NOMMUF.FOR (7143-7235)	SUBR.	5317	HFMUFS	-	NONE
OUTALL.FOR (7237-7409)	SUBR.	6807	LUFFY	-	OUTPAR-L# 7303; OUTTOP (2)-L# 7307 & 7367
OUTANT.FOR (7411-7533)	SUBR.	4762	GETANT	-	NONE
OUTBOD.FOR (7535-7731)	SUBR.	7831	OUTLIN	-	FLOLIN (14)-L# 7646,7648,7651,7659, 7690,7693,7696,7699,7702,7705,7708, 7711,7722 & 7725; FIXLIN (7)-L# 7656,7664,7669,7674,7677,7682 & 7687
OUTCOM.FOR (7733-7747)	SUBR.	5375	HFMUFS	-	NONE
OUTGPH.FOR (7749-7763)	SUBR.	5371	HFMUFS	-	OUTTOP-L# 7757; SETGPH-L#7759;
		5420	HFMUFS	-	GPHBOD-L# 7761
OUTION.FOR (7765-7778)	SUBR.	5312	HFMUFS	-	LECDEN-L# 7773; GENION-L# 7774; IONPLT-L# 7775
OUTKMF.FOR (7780-7786)	SUBR.	5378	HFMUFS	-	NONE
OUTLAY.FOR (7788-7816)	SUBR.	5363	HFMUFS	-	OUTTOP-L# 7800
OUTLIN.FOR (7818-7833)	SUBR.	5356	HFMUFS	-	OUTTOP-L# 7829; OUTBOD-L# 7831
OUTLNG.FOR (7835-7866)	SUBR. (Must of been replaced)	NONE		-	OUTTOP-L# 7856
OUTMUF.FOR (7868-7948)	SUBR.	5367	HFMUFS	-	OUTTOP-L# 7890
		5415	HFMUFS	-	
OUTPAR.FOR (7950-8020)	SUBR.	5308	HFMUFS	-	OUTTOP-L# 7985
		7303	OUTALL	-	
OUTTAB.FOR (8022-8042)	SUBR.	5360	HFMUFS	-	OUTTOP-L# 8039; TABBOD-L# 8040

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.		Subroutines CALLED and the Line #	
OUTTOP.FOR (8044-8189)	SUBR.	5855	IONPLT	-	
		7307	OUTALL	-	
		7367	OUTALL	-	
		7757	OUTGPH	-	
		7800	OUTLAY	-	NONE
		7829	OUTLIN	-	
		7856	OUTLNG	-	
		7890	OUTMUF	-	
		7985	OUTPAR	-	
		8039	OUTTAB	-	
PEN.FOR (8191-8202)	FUNC.	1085	CURMUF	-	
		4230	GENION	-	NONE
		8200	PEN	-	
PENANG.FOR (8204-8281)	SUBR.	3100	FINDF	-	NONE
PRBMUF.FOR (8283-8343)	FUNC.	2209	ESMOD	-	
		2216	ESMOD	-	
		2222	ESMOD	-	
		2259	ESMOD	-	
		2562	ESREG	-	
		2571	ESREG	-	
		2577	ESREG	-	
		2610	ESREG	-	
		2612	ESREG	-	
		2620	ESREG	-	
		2624	ESREG	-	
		2629	ESREG	-	
		2637	ESREG	-	
		2641	ESREG	-	
		2646	ESREG	-	
		3520	FVHF	-	
		5588	INMOD	-	
		6541	LNGPAT	-	
		6544	LNGPAT	-	NONE
		6547	LNGPAT	-	
		8341	PRBMUF	-	
		8693	REGMOD	-	
		8699	REGMOD	-	
		8704	REGMOD	-	
		8745	REGMOD	-	
		8753	REGMOD	-	
		8758	REGMOD	-	
		8773	REGMOD	-	
		9799	SETRCR	-	
		9823	SETRCR	-	
		9965	SETTMT	-	
		9990	SETTMT	-	
		10124	SIGDIS	-	
		10132	SIGDIS	-	

Continued on Next Page

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.			Subroutines CALLED and the Line #
PRBMUF.FOR	SUBR.	10143	SIGDIS	-	Cont'd.from Previous Page
		10148	SIGDIS	-	
		10159	SIGDIS	-	NONE
		10164	SIGDIS	-	
REDMAP.FOR (8345-8526)	SUBR.	1537	DECRED	-	NONE
REGMOD.FOR (8528-8799)	SUBR.	5500	INMOD	-	FDIST-L# 8604; INMUF-L# 8607;
		5571	INMOD	-	GAIN (3)-L# 8711, 8719, & 8722
		6754	LUFFY	-	
RELBIL.FOR (8801-9016)	SUBR.	6790	LUFFY	-	NONE
SANG.FOR (9018-9060)	SUBR.	6662	LUFFY	-	NONE
SELMOD.FOR (9062-9098)	SUBR.	6664	LUFFY	-	NONE
SELRCR.FOR (9100-9163)	SUBR.	6783	LUFFY	-	NONE
SELTMT.FOR (9165-9239)	SUBR.	6781	LUFFY	-	NONE
SERPRB.FOR (9241-9330)	SUBR.	6795	LUFFY	-	NONE
SETGPH.FOR (9332-9407)	SUBR.	7759	OUTGPH	-	NONE
SETLNG.FOR (9409-9495)	SUBR.	6683	LUFFY	-	NONE
SETLUF.FOR (9497-9534)	SUBR.	5343	HFMUFS	-	NONE
SETOUT.FOR (9536-9683)	SUBR.	5237	HFMUFS	-	NONE
SETRCR.FOR (9685-9831)	SUBR.	4963	GMLOSS	-	GAIN (2)-L# 9808 & 9813
SETTMT.FOR (9833-9999)	SUBR.	4961	GMLOSS	-	GAIN (2)-L# 9975 & 9981
SIGDIS.FOR (10001-10171)	SUBR.	6694	LUFFY	-	SYSSY-L# 10044
SYSSY.FOR (10173-10236)	SUBR.	10044	SIGDIS	-	NONE

Table 4: Subprograms of the Modified IONCAP program.

Filename/ Line #'s	File Type	CALLED in L.# & SUBR.			Subroutines CALLED and the Line #
TABBOD.FOR (10238-10324)	SUBR.	8040	OUTTAB	-	NONE
TABS.FOR (10326-10356)	SUBR.	6399	LNGOUT	-	NONE
		6412	LNGOUT	-	
		6491	LNGPAT	-	
TIMVAR.FOR (10358-10419)	SUBR.	5299	HFMUFS	-	EF1VAR-L# 10400; NOISY-L# 10408
VERSY.FOR (10421-10514)	SUBR.	2017	EF1VAR	-	NONE
		2075	ESIND	-	
		2883	F2VAR	-	
VIRTIM.FOR (10516-10575)	SUBR.	5295	HFMUFS	-	NONE
XLIN.FOR (10577-10610)	FUNC.	4222	GENION	-	NONE
		5511	INMOD	-	
		10084	SIGDIS	-	
		10588	XLIN	-	
		10595	XLIN	-	
		10603	XLIN	-	
		10608	XLIN	-	

(NOTE: File Type FUNC. are not CALLED in, but Used in the listed subroutines.)

IV. LISTING OF THE NEW SUBROUTINE ALLMODES.FOR

```

SUBROUTINE ALLMODES(iflg,fval)
C
C THIS ROUTINE outputs THE binary values for the allmodes method
C
COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),
A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,
B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,
C NUMNAM, NUPROC, MAXMET, mspec, m100
COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
1, SPR, SU, SUS, XNOISE, ZNOISE, NF
COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
COMMON / allMODE /zABPS(20),zCREL(20),zFLDST(20),zHN(20),zHP(20),
1zPROB(20),zRELY(20),zRGAIN(20),zSIGPOW(20),zSN(20),
2zSPRO(20),zTGAIN(20),zTIMED(20),zTLOSS(20),zB(20),zFSLOS(20),
CizNMODE(20),zTLLOW(20),zTLHGH(20),zEFF(20),NREL,NMMOD

common/indicez/ispot,iseaz,ifqn,iour,inmmd(11,24,4,2)
dimension xb(20)
C
if(iflg.eq.0)then
  nmmmod=0
  do 2 i=1,20
    ztloss(i)=32000.
    ztllow(i)=999.
    ztlhgh(i)=999.
    ZHP(I)=-1
    xb(i)=99.
  2 continue
  freq=fval
  RETURN
else if(iflg.eq.1)then
  hp(2)=hp(1)
  nmode(2)=nmode(1)
  zTLOSS(2)=32000.
  ist=1
  lst=2
else if(iflg.eq.2)then
  ist=4
  lst=5
else
  ist=1
  lst=6
endif
do 10 i=ist,lst
  if(hp(i).gt.0.)then

```

```

nmmod=nmmod+1
ztloss(nmmod)=tloss(i)
ztllow(nmmod)=tllow(i)
ztlhgh(nmmod)=tlhgh(i)
if(mspec.eq.125)then
  ihn=1000.*hn(i)
  ilay=100.*nmode(i)
  xb(nmmod)=b(i)+ihn+ilay
else
  zhp(nmmod)=hp(i)
  zcrel(nmmod)=crel(i)
  zrely(nmmod)=rely(i)
  zhn(nmmod)=hn(i)
  iznmode(nmmod)=nmode(i)
  zsn(nmmod)=sn(i)
  zfldst(nmmod)=fldst(i)
  zsigpow(nmmod)=sigpow(i)
  zb(nmmod)=b(i)
  ztimed(nmmod)=timed(i)
  zabps(nmmod)=abps(i)
  zprob(nmmod)=prob(i)
  zrgain(nmmod)=rgain(i)
  ztgain(nmmod)=tgain(i)
  zfslos(nmmod)=fslos(i)
  zspro(nmmod)=spro(i)
  zeff(nmmod)=eff(i)
endif
endif
10 continue
if(fval.eq.999.)then
  inmmd(ifqn,iour,iseaz,ispot)=NMMOD
  if(nmmod.eq.0)NMMOD=1
  if(mspec.eq.125)write(m100)nmmod,freq,(ztloss(i),xb(i),
+ ztllow(i),ztlhgh(i),i=1,nmmod),rcnse,du,dl
ENDIF
return
end

```

V. LISTINGS OF FOUR IONCAP SUBROUTINES SUPPORTING THE UPDATED NOISE MODEL

The following pages list the subroutines ANOIS1, NOISY, GENFAM, and GENOIS, as provided in NTIA Report 87-212, which describes the Updated Noise Model for IONCAP. See Section IIC for information regarding the changes made to IONCAP 85.04 in producing the Modified IONCAP program.

```

SUBROUTINE ANOIS1
C
C THIS ROUTINE DETERMINES THE 1 MHZ ATMOSPHERIC NOISE
C
C FOURIER SERIES IN LATITUDE AND LONGITUDE FOR TWO DISCRETE
C LOCAL TIME BLOCKS
C
COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
COMMON /CON /D2R, DCL, GAMA, P1, P12, F102, R2D, RZ, VOFL
COMMON / CON / ALATD, AMIN, AMIND, DLONG, DMP, ERTR,
1 PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
2 TLAT, TLATD, TLONG, TLONGD, FLUX, SSN, ATMNO, D90R, D50R,
3 D10R, D90S, D50S, D1CS
COMMON /FILES/ LUQ,LUI,LU25,LU26
COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24),ITIM,JTX
COMMON / TWO / F2D(16,6,6), DUD(5,12,5),FAM(14,12),
A SYS(9,16,6), PERR(9,4,6), P(29,16,8),ABP(2,9)
C LMT AT RCVR SITE
IF(F2D(1,1,1)) 90, 90, 100
C.....NO IONOSPHERIC LONG TERM DATA BASE FILE
C.....SET NOISE TO ZERO HERE (-204 IN SUBROUTINE GENOIS)
C.....THE USER CAN INPUT ANY VALUE AS MAN-MADE NOISE (RESET IN GENOIS)
90 ATNU = 0.0
ATNY = 0.0
RETURN
100 CC = GMTR
KJ= 6
IF(CC-22.) 105,110,110
105 KJ = CC/4. +1.
110 TM = 4*KJ-2
IF(CC-TM) 115,120,125
115 JK = KJ -1
GO TO 130
120 JK = KJ
GO TO 130
125 JK = KJ+1
130 IF(JK) 135,135,140
135 JK =6
GO TO 150
140 IF(JK-6) 150,150,145
145 JK = 1
C.....EAST LONGITUDE (IN DEGREES)
150 CEG= RLONGD
165 XLA = RLAT + R2D
C.....LATITUDE (IN DEGREES) "+" IS NORTH
CALL NOISY(KJ,XLA,CEG,ATNU)
CALL NOISY(JK,XLA,CEG,ATNY)
RETURN
END

```

```

SUBROUTINE NOISY (KJ, XLA, CEG, ANOS)
C   NOISY IS A GENERAL PURPOSE ROUTINE USED TO EVALUATE A FOURIER
C   SERIES IN TWO VARIABLES.
C   KJ --- NUMBER OF FOURIER COEFFICIENT ARRAY TO BE USED
C   XLA --- GEOGRAPHIC LATITUDE, DEGREES,
C   CEG --- GEOGRAPHIC EAST LONGITUDE, DEGREES
C   ANOS --- NOISE VALUE, MEDIAN POWER DB ABOVE KTB
C   ABP --- NORMALIZING FACTORS FOR FOURIER SERIES
C   KJ = 1 TO 6 IS ATMOSPHERIC NOISE, KJ = 7 IS LAND MASS MAP AND
C   KJ = 8 IS RATIO OF F2 HEIGHT OF MAXIMUM TO SEMITHICKNESS
C
C   * NOTE - XLA, CEG, ANOS, ABP ARE NOT ALWAYS AS PREVIOUSLY DEFINED
C   FOURIER VARIABLES AND ATMOSPHERIC RADIO NOISE
C
COMMON / TWO / F2D(16,6,6), DUD(5,12,5),FAM(14,12),
A SYS(9,16,6), PERR(9,4,6),P(29,16,8),ABP(2,9)
COMMON /SWTCH/ INIL,OSSN,OMONTH,OTIME,ODIP,OLAT,OLONG
DIMENSION SX (15), SY(29), ZZ (29)
IF (KJ - 8)105, 100, 105
C.....LIMITS OF FOURIER SERIES
100  LM = 15
    LN = 10
    GO TO 110
C.....LIMITS OF FOURIER SERIES
105  LM = 29
    LN = 15
C.....HALF ANGLE (IN RADIANS)
110  Q = .0087266466 * CEG
    IF(CEG .EQ. OLONG .AND. INIL .EQ. 0) GO TO 118
C.....LONGITUDE SINES
DO 115 K = 1, 15
115  SX(K)=SIN(Q*K)
    OLONG=CEG
118  CONTINUE
C.....LONGITUDE SERIES
DO 125 J = 1, LM
    R = 0.
    DO 120 K = 1, LN
120  R = R + SX (K) * P (J, K, KJ)
125  ZZ (J) = R + P (J, 16, KJ)
C.....ANGLE PLUS 90 DEGREES (IN RADIANS)
    Q = .01745329252 * (XLA + 90.)
    IF(XLA .EQ. OLAT .AND. INIL .EQ. 0) GO TO 145
C.....LATITUDE SERIES
DO 140 J=1,29
140  SY(J)=SIN(Q*J)
    INIL=0
    OLAT=XLA
145  CONTINUE
    R = 0.
    DO 130 K = 1, LM
130  R = R + SY (K) * ZZ (K)
C.....FINAL FOURIER SERIES EVALUATION (NOTE LINEAR NORMALIZATION)
135  ANOS = R + ABP(1,KJ)+ACP(2,KJ)* Q
    RETURN
END

```

```

SUBROUTINE GENFAM(Y2,IBLK,FREQ,Z,FA,DU,DL,DMS,DUS,DLS)
C
C GENFAM CALCULATES THE FREQUENCY DEPENDENCE OF THE ATMOSPHERIC
C NOISE AND GETS DECILES AND PREDICTION ERRORS FROM TABLES
C
COMMON / TWO / F2D(16,6,6), DUD(5,12,5),FAM(14,12),
A SYS(9,16,6), PERR(9,4,6), P(29,16,8),ABP(2,9)
DIMENSION V(5)
IF(F2D(1,1,1) ) 90,90,95
C.....NO IONOSPHERIC LONG TERM DATA BASE FILE (SET IN SUBROUTINE GENOIS)
90 FA = 0.0
DU=9.
DL=7.
DUS=1.5
DLS=1.5
DMS=3.
RETURN
95 CONTINUE
IBK=IBLK
C.....CHECK IF LATITUDE IS NORTH OR SOUTH
IF (Y2)100, 105, 105
100 IBK = IBK + 6
105 U1 = - .75
X = .43429 * ALOG (FREQ)
U = (8. * 2. * X - 11.) / 4.
KOP = 1
110 PZ = U1 * FAM (1, IBK) + FAM (2, IBK)
PX = U1 * FAM (8, IBK) + FAM (9, IBK)
DO 115 I = 3, 7
PZ = U1 * PZ + FAM (I, IBK)
115 PX = U1 * PX + FAM (I + 7, IBK)
IF(KOP-1) 120,120,125
120 CZ = Z * PZ + PX
CZ = Z + Z - CZ
U1 = U
KOP = 2
GO TO 110
125 FA = CZ * PZ + PX
DO 145 I = 1, 5
Y = DUD (1, IBK, I)
DO 140 J = 2, 5
IF (J - 5)140, 130, 140
130 IF (X - 1.)140, 140, 135
135 X = 1.
140 Y = Y * X + DUD (J, IBK, I)
145 V (I) = Y
DU = V (1)
DL = V (2)
DUS = V (3)
DLS = V (4)
DMS = V (5)
RETURN
END

```

```

SUBROUTINE GENOIS
C
C THIS ROUTINE COMPUTES THE COMBINED NOISE DISTRIBUTION
C
COMMON / DON / ALATD, AMIN, AMIND, DLONG, DMP, ERTA,
1 PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
2 TLAT, TLATD, TLONG, TLONGD, FLUX, SSN, ATMNO, D7OR, D5OR,
3 D1OR, D9OS, D5OS, D1OS
COMMON/F:ILES/ LU0,LU1,LU25,LU26
COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, ZCNSE, REL, SL, SLS
1, SPR, SU, SUS, TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
COMMON/FRO/FREL(29),FREQ,JMODE
COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
A IHRO, IHRS, JO, LUFF, METHOD, MONPR, NDAY, NES, NOISE, NPAT,
B NPSL, NRSP, NUMO
COMMON / METSET / ITRUN, ITOUT, JTRUN(40), JTOUT(40)
COMMON/ROK/RAT(5),CLCK(5),ABIY(5),ARTIC(5),SIGPAT(5),EPSPAT(5),
A FI(3,5),YI(3,5),HI(3,5),FX(3,5),HPRIM(30,3),HTRUE(30,3),
B FVERT(30,3),KFX,AFAC(30,3),HNOR(3),HTR(50),FNSQ(50)
COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IP
1 ANT, RETA, RSIG, REFS, RND, RNL, RNH, REX(4), TEFF, REFF, KASANT
COMMON / TWO / F2D(16,2,6), DUD(5,12,5),FAM(14,12),
A SYS(9,16,6), PERR(9,4,6), P(29,16,8),ABP(2,9)
COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
2 SPRO (7), TGAIn (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
C (7),DBF(7),NMODE(7),NPROB,NREL,TLOW(7),TLHGH(7)
DIMENSION XNINT(4)
C.....MAN-MADE NOISE LEVELS AS GIVEN BY CCIR REPORT 258.
DATA XNINT /76.8, 72.5, 67.2, 53.6/
DATA DFAC,BFAC,CFAC/7.87384,30.99872,5.56765/
C
C 7.87384=SQRT(2*1.282**2+4.34294**2)
C
C 30.99872=(1.282**2)(4.34294**2)
C
C 5.56765=4.34294*1.282
C
C.....DATA IS FA VALUES AT 1 MHZ
C.....ATNU, ATNY ARE DB .GT. KTB FOR 1 MHZ
C.....ATNZ, ATNX ARE DB .GT. KTB FOR DESIRED FREQ,DUM
C.....ATNOS, GNOS, XNOIS ARE DB .GT. KTB FOR ALL CALCULATIONS
C.....AND ARE CONVERTED TO DBW(1 HZ BWTH) AT END OF ROUTINE
C.....UPPER LIMIT IS 55 MHZ FOR NOISE
DUME = AMINI(FREQ,55.)
MAN=NOISE
C FREQUENCY DEPENDENCE ATMOSPHERIC NOISE
IF(F2D(1,1,1)) 85, 90, 90
C.....NO IONOSPHERIC LONG TERM DATA BASE FILE
C.....FORCE MAN-MADE NOISE OR GALACTIC NOISE
85 ATNOS = C.

```

```

DUA=9.
DLA=7.
SMA = 3.
SUA = 1.5
SLA = 1.5
GO TO 95
90 CONTINUE
C.....FREQUENCY DEPENDENCE
CALL GENFAM(RLAT,KJ,DUME,ATNU,ATNZ,DU,DL,SIGM,SIGU,SIGL)
CALL GENFAM(RLAT,J<,DUME,ATNV,ATNX,DX,DQ,SIGZ,SIGX,SIGSQ)
C.....BEGIN OF INTERPOLATION ON LOCAL TIME
SLOP = ABS(CC-TM)/4.
ATNOS = ATNZ + (ATNX - ATNZ) * SLOP
DUA= DU + (DX-DU)*SLOP
DLA= DL + (DQ-DL)*SLOP
SMA= SIGM+ (SIGZ-SIGM)*SLOP
SUA= SIGU + (SIGX-SIGU)*SLOP
SLA= SIGL+(SIGSQ-SIGL)* SLOP

C
C (DUA/DFAC)**2=(DUA/1.282)**2/(2*4.34294**2)
C = (DUA/SQRT(2*1.282**2*4.34294**2))**2
C = (DUA/7.87384)**2
C
95 AU=EXP((DUA/DFAC)**2 + (ATNOS/4.34294))
VU=AU*AU*(EXP(DUA*DUA/BFAC)-1.)
AL=EXP((DLA/DFAC)**2 + (ATNOS/4.34294))

C
C DLA*DLA/BFAC=(DLA/1.282)**2/(4.34294)**2
C =DLA**2/30.99872
C
VL=AL*AL*(EXP(DLA*DLA/BFAC)-1.)
C GALACTIC NOISE
IF(FREQ -- FI(3,KFX)) 100, 100, 105
C.....GALACTIC NOISE DOES NOT PENETRATE
100 GNOS = 0.
GO TO 110
105 GNOS = 52. - 23. * ALOG10(FREQ)
110 DUG=2.
AT=EXP((DUG/DFAC)**2 + (GNOS/4.34294))
AU=AU+AT
VU=VU+AT*AT*(EXP(DUG*DUG/BFAC)-1.)
DLG=2.
AT=EXP((DLG/DFAC)**2 + (GNOS/4.34294))
AL=AL+AT
VL=VL+AT*AT*(EXP(DLG*DLG/BFAC)-1.)
SMG = .5
SUG = .2
SLG = .2
C MAN MADE NOISE
MAN=NOISE
XNOIS = MAN
MA = IABS(MAN)
ZNOISE=XNOIS
IF(MAN) 120, 114, 115

```

```

C.....INDICATES -164 ON USER INPUT
114 MA = 4
GO TO 120
C.....CONVERT 3 MHZ DB .LT. 1 WATT INPUT VALUE TO FA AT 1 MHZ
115 XNOIS=204.0-XNOIS+13.22
C.....OBTAIN FA AT DESIRED FREQUENCY
XNOIS = XNOIS - 27.7 * ALOG10(FREQ)
GO TO 123
C.....NEGATIVE ON USER INPUT INDICATES INDEX
120 MA = MINO(4,MA)
CONN=27.7
IF(MA .EQ. 4) CONN=28.6
XNOIS = XNINT(MA) * CONN + ALOG10(FREQ)
ZNOISE = 204.0 - XNINT(MA) + 13.22
125 DUM=9.7
AT=EXP((DUM/DFAC)**2+(XNOIS/4.34294))
AU=AU+AT
VU=VU+AT*AT*(EXP(DUM*DUM/BFAC)-1.)
DLM=6.
AT=EXP((DLM/DFAC)**2+(XNOIS/4.34294))
AL=AL+AT
VL=VL+AT*AT*(EXP(DLM*DLM/BFAC)-1.)
SUM=1.5
SMM=5.4
SLM=1.5
C.....RECEIVER ANTENNA EFFICIENCY
CALL GAIN(2,KASANT,0.0,FREQ,GDUM,REFF)
XEFF = REFF
ZEFF=XEFF
C.....SET ARRAY FOR ALL POSSIBLE MODES
DO 196 IM=1,6
196 EFF(IM) = XEFF
C.....NOW DETERMINATION OF NOISE LEVEL IS ITS-78(HFMUFES4)
C.....SWITCH TO DB .GT. WATT
ATNOS=ATNOS-204.
GNOS=GNOS-204.
XNOIS=XNOIS-204.
SIGTSQ=ALOG(1.+VU/(AU*AU))
XRNSE= 4.34294*(ALOG(AU)-SIGTSQ/2.) -204.
C.....UPPER DECILE
C
C CFAC=4.34294*1.282
C =5.36765
C
DU= CFAC*SQRT(SIGTSQ)
SIGTSQ=ALOG(1.-VL/(AL*AL))
C.....LOWER DECILE
DL= CFAC*SQRT(SIGTSQ)
IF(1TRUN - 8) 205, 210, 205
205 QPA = 10. ** ((ATNOS - XRNSE) * .1)
QPG = 10.**((GNOS -XRNSE)*.1)
C.....PREDICTION ERRORS
C.....SIGM IS MEDIAN, SIGU IS UPPER AND SIGL IS LOWER
QPM = 10.**((XNOIS-XRNSE)*.1)

```

```

C      SIGM= SQRT((QPA*SMA)**2 + (QPG*SMG)**2 + (QPM*SMM)**2)
C
C      0.23026=1.0/4.34294
C
      PV=QPA*EXP((DUA-DU)*.23026)
      SIGU= (PV*SUA)**2+((PV-QPA)*SMA)**2
      PV=QPG*EXP((DUG-DU)*.23026)
      SIGU=SIGU+(PV*SUG)**2+((PV-QPG)*SMG)**2
      PV=QPM*EXP((DUM-DU)*.23026)
      SIGU=SQRT(SIGU+(PV*SUM)**2+((PV-QPM)*SMM)**2)
      PV=QPA*EXP((DLA-DL)*.23026)
      SIGL= (PV*SLA)**2+((PV-QPA)*SMA)**2
      PV=QPG*EXP((DLG-DL)*.23026)
      SIGL=SIGL+(PV*SLG)**2+((PV-QPG)*SMG)**2
      PV=QPM*EXP((DLM-DL)*.23026)
      SIGL=SQRT(SIGL+(PV*SLM)**2+((PV-QPM)*SMM)**2)
C RCVR SITE NOISE = TOTAL NOISE + ANTENNA EFFICIENCY (ADDED TO SIGNAL
C   WITH GAIN)
      210 RCNSE = XRNSE + XEFF
          ZCNSE=RCNSE
          ATMND=ATNOS
          XADJN=1.
          XNOISE=XNOIS
          ATMD=ATNOS
          RETURN
          END

```

VI. LISTING OF ANTENNA PATTERN GENERATION SUBPROGRAM MAKDAT.FOR

```

C      PROGRAM MAKDAT.FOR
C
C      THIS PROGRAM CREATES A RECEIVER AND TRANSMITTER ANTENNA
C      PATTERN FILE FOR INPUT TO IONCAP.
C      9 SEPT 1985
C
      DIMENSION XFQS(3),XFQE(3),YNH(3),YNL(3),YND(3),
*          YETA(3),TEY(3,4),COND(3),DIEL(3),ARRAY(30,91),AEFF(30),
*          TOAZ(3),AREFF(30)
      CHARACTER*6 LABANT(2,3)
C
      DATA NA/1/,JTSANT/1/,XFQS/1.,1.,1./,XFQE/30.,30.,30./,
*  YNH/0.,0.,0./,YNL/0.,0.,0./,YND/0.,0.,0./,YETA/0.,0.,0./,
*  TEY/12*0./,COND/.01,.01,.01/,DIEL/10.,10.,10./,
*  TOAZ/0.,0.,0./,LABANT/6*      '/
*  AEFF/30*0./,AREFF/30*-4.8/
      DATA (ARRAY(I,I),I=1,91)/
*      -20.0,-14.0,-11.0,-7.6,-5.4,-4.0,-3.2,-2.5,-1.8,-1.6,
*      -1.3,-1.1,-.9,-.6,-.5,-.4,-.2,-.1,0,0,0,0,0,0,0,
*      -.1,-.2,-.2,-.2,-.3,-.3,-.4,-.5,-.5,-.6,-.7,-.8,-.8,
*      -.9,-.1,-1.1,-1.2,-1.4,-1.5,-1.6,-1.8,-1.9,-2.,-2.1,
*      -2.3,-2.4,-2.6,-2.7,-2.9,-3.1,-3.2,-3.4,-3.6,-3.7,
*      -3.9,-4.2,-4.4,-4.7,-5.0,-5.4,-5.7,-6.0,-6.4,-6.7,
*      -7.1,-7.5,-7.9,-8.4,-8.8,-9.3,-9.8,-10.4,-10.9,-11.4,
*      -12.,-12.6,-13.2,-13.9,-14.6,-15.4,-16.2,-17.2,-18.2,
*      -19.6,-21.9/
C
      OPEN (UNIT=2,FILE='TAPE26',STATUS='UNKNOWN',FORM='UNFORMATTED')
C
C      RECEIVER ANTENNA PATTERNS
C
      DO 20 I=2,30
        DO 30 J=1,91
          ARRAY(I,J) = ARRAY(1,J)
30      CONTINUE
20      CONTINUE
      LABANT(1,1)='SWWHIP'
C
      WRITE (2) NA,JTSANT,(XFQS(ITY),XFQE(ITY),LABANT(1,ITY),
*  LABANT(2,ITY),YNH(ITY),YNL(ITY),YND(ITY),TOAZ(ITY),
*  (TEY(ITY,K),K=1,4),COND(ITY),DIEL(ITY),ITY=1,3),
*  ((ARRAY(I,J),I=1,30),J=1,91),(AREFF(I),I=1,30)
C
C      TRANSMITTER ANTENNA PATTERNS
C
      ARRAY(1,1) = -26.
      ARRAY(1,2) = 5.
      ARRAY(1,3) = 10.
      ARRAY(1,4) = 15.
      ARRAY(1,5) = 17.
      LABANT(1,1) = 'CONS17'
C
      DO 40 I=6,91
        ARRAY(1,I) = 17.
40      CONTINUE
      DO 50 I=2,30
        DO 60 J=1,91
          ARRAY(I,J)=ARRAY(1,J)
60      CONTINUE
50      CONTINUE

```

C

```
WRITE (2) NA,JTSANT,(XFQS(ITY),XFQE(ITY),LABANT(1,ITY),  
* LABANT(2,ITY),YNH(ITY),YNL(ITY),YND(ITY),TOAZ(ITY),  
* (TEY(ITY,K),K=1,4),COND(ITY),DIEL(ITY),ITY=1,3),  
* ((ARRAY(I,J),I=1,30),J=1,91),(AEFF(I),I=1,30)  
CLOSE (2)  
END
```

VII. LISTING OF SOURCE CODE MODIFICATIONS

BABS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BABS.FOR;1

6 COMMON/FRQ/FREL(29),FREQ
7 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BABS.FOR;1

6 COMMON / FRQ / FREL(29), FREQ, JMODE
7 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BABS.FOR;1

10 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
11 COMMON/SIGD/DSL,ASM,DSM,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BABS.FOR;1

10 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
11 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
12 2HTR(50), FNSQ(50)
13 COMMON/SIGD/DSL,ASM,DSM,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU

Number of difference sections found: 2
Number of difference records found: 4

BEARNG.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BEARNG.FOR;1

5 COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,
6 1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
7 2 TLAT, TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
8 COMMON / RTANT / XETA, XSIG, XEPS, XND, XNL, XNH, TEX(4), ITANT,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BEARNG.FOR;1

5 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
6 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
7 2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
8 COMMON / RTANT / XETA, XSIG, XEPS, XND, XNL, XNH, TEX(4), ITANT,

Number of difference sections found: 1
Number of difference records found: 3

BENDY.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BENDY.FOR;1

5 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
6 X = F/ FI(I,K)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BENDY.FOR;1

5 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
6 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
7 2HTR(50), FNSQ(50)
8 X = F/ FI(I,K)

Number of difference sections found: 1
Number of difference records found: 3

BLKDAT.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

16 COMMON/ANOIS/ATNU,ATNY,CC, TM,ZEFF,ZCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK
17 C CONSTANTS,SET BELOW.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

16 COMMON/ANOIS/ATNU,ATNY,CC, TM,RCNSE,DU,DL,SIGM,SxGU,SxGL,KJ,JK
17 C CONSTANTS,SET BELOW.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

22 C NUMNAM, NUPROC, MAXMET
23 C WEIGHTS AND ABSCISSCAE FOR 40 POINT GUASSIAN SET BELOW.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

22 C NUMNAM, NUPROC, MAXMET, mspec, m100
23 C WEIGHTS AND ABSCISSCAE FOR 40 POINT GUASSIAN SET BELOW.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

27 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
28 2ATD,TLONG,TLONGD,BRTD,FLUX,SSN,ATMNO,D90R,D50R,D10R,D90S,D50S,D10S
29 C SPORADIC E LAYER, SEE SUBR. ESIND.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

27 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
28 2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
29 COMMON / OUTLAB / LABEL(11), LAYTYP(5), IEAST, INORTH, ISOUTH,
30 A IWEST, LABLI, LABLJ, LABLK
31 C SPORADIC E LAYER, SEE SUBR. ESIND.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

39 C GEOGRAPHIC VARIABLES AT SAMPLE AREAS,SEE GEOM,TIMVAR,MAGVAR AND LUFFY.
40 COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

41 C GEOGRAPHIC VARIABLES AT SAMPLE AREAS,SEE GEOM,TIMVAR,MAGVAR AND
LUFFY.

42 COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

48 C LONG PATH PARAMETERS,SEE SUBRS LNGLUF AND LNGPAT.
49 COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

50 C LONG PATH PARAMETERS,SEE SUBR LNGPAT.
51 COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

67 COMMON / OUTLAB / LABEL(11), LAYTYP(5), IEAST, INORTH, ISOUTH,
68 A IWEST, LABLI, LABLJ, LABLK
69 C LAT AND LONG DIRECTION INDICATORS, LINE NUMBER AND MAXIMUM LINES

BLKDAT.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

69 C LAT AND LONG DIRECTION INDICATORS, LINE NUMBER AND MAXIMUM LINES

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

75 COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG

76 C REFLECTRICIES AT FREQ, SEE SUBR. FINDF.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

75 COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG

76 C REFLECTRICIES AT FREQ, SEE SUBR. FINDF.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

80 C ,DELPEN(3,3)

81 C GEOGRAPHIC AND IONSPHERIC DATA AT SAMPLE AREAS,SEE GEOM AND GENION.

82 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI

83 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM

84 B , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)

85 C ANTENNA DATA(INPUT), SEE AERIAL AND HFMUFES.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

80 C ,DELPEN(3,5)

81 C GEOGRAPHIC AND IONSPHERIC DATA AT SAMPLE AREAS,SEE GEOM AND GENION.

82 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

83 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

84 2HTR(50), FNSQ(50)

85 C ANTENNA DATA(INPUT), SEE AERIAL AND HFMUFES.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

94 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),

95 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

94 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),

95 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

102 COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL, SLS

103 1, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF

104 C LOSSES FOR MODES. SEE SUBR. REGMOD.

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

102 COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS

103 1, SPR, SU, SUS, XNOISE, ZNOISE, NF

104 C LOSSES FOR MODES. SEE SUBR. REGMOD.

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

108 COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),

109 1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),

110 2 SPRO (7), TGAIN (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV

111 C (7),OBF(7),NMODE(7),NPROB,NREL,TLLOW(7),TLHGH(7)

112 C NUMERICAL MAP COEFICENTS, SEE REDMAP.

BLKDAT.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

```
108      COMMON / allMODE /ABPS(20),CREL(20),FLDST(20),HN(20),HP(20),
109      1PROB(20),RELY(20),RGAIN(20),SIGPOW(20),SN(20),
110      2SPRO(20),TGAIN(20),TIMED(20),TLOSS(20),B(20),FSLOS(20),
111      CNMODE(20),TLLOW(20),TLHGH(20),EFF(20),NREL,NMMOD
112      C NUMERICAL MAP COEFICENTS, SEE REDMAP.
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

```
190      DATA ADJ/1./,ADS/1./,ATMO/1./,GNOS/1./,GOT/1./,PWRDB/1./
191      DATA RCNSE/-204./,REL/.01/,SL/1./,SLS/1./,SPR/.01/,SU /1./,SUS/1./
192      DATA TIMER/1./,XADJN/1./,XEFF/1./,XNOISE/1./,XTLOS/1./
193      DATA ZNOISE/-204./, NF/1/, FLUX/1./, ATMNO/1./, DMP/0.85/
194      DATA ERTR/1./, PMP/10./, PWR/1./, RSN/1./, SIGTR/1./
195      DATA ATNU/-204./,ATNY/-204./,CC/1./,TM/1./,ZEFF/1./,ZCNSE/-204./
196      DATA DU/9./,DL/4./,SIGM/1.5/,SXGL/1./,SXGU/1./,KJ/1/,JK/1/
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

```
190      DATA ADJ/1./,ADS/1./,GNOS/1./,GOT/1./,PWRDB/1./
191      DATA RCNSE/-204./,REL/.01/,SL/1./,SLS/1./,SPR/.01/,SU /1./,SUS/1./
192      DATA XNOISE/1./
193      DATA ZNOISE/-204./, NF/1/, FLUX/1./, DMP/0.85/
194      DATA ERTR/1./, PMP/10./, PWR/1./, RSN/1./, SIGTR/1./
195      DATA ATNU/-204./,ATNY/-204./,CC/1./,TM/1./
196      DATA DU/9./,DL/4./,SIGM/1.5/,SXGL/1./,SXGU/1./,KJ/1/,JK/1/
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

```
213      B NUMNAM/31/, MAXNAM/100/, MAXMET/30/, IRED/1/
214      DATA NPROB/1/, NREL/1/, IEDP/-1/, TLONG/.68965/
215      DATA AMIND/3./, AMIN/.05236/
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

```
213      B NUMNAM/31/, MAXNAM/100/, MAXMET/30/, IRED/1/, mspec/0/,m100/75/
214      DATA NMMOD/1/, NREL/1/, IEDP/-1/, TLONG/.68965/
215      DATA AMIND/3./, AMIN/.05236/
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]BLKDAT.FOR;1

```
242      DATA VERSN /85.04/
243      C
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]BLKDAT.FOR;1

```
242      DATA VERSN /88.01/
243      C
```

Number of difference sections found: 14

Number of difference records found: 32

CALVHF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]CALVHF.FOR;1

14 COMMON/TIME/IT,GMT,UTIME(24)

15 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]CALVHF.FOR;1

14 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX

15 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]CALVHF.FOR;1

20 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),

21 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]CALVHF.FOR;1

20 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),

21 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

Number of difference sections found: 2

Number of difference records found: 2

CISI.FOR

Number of difference sections found: 0

Number of difference records found: 0

CNGTIM.FOR

Number of difference sections found: 0

Number of difference records found: 0

CONVH.FOR

Number of difference sections found: 0

Number of difference records found: 0

CURMUF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]CURMUF.FOR;1

14 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)

15 A,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)

16 B ,FX(3,5),HTR(50),FNSQ(50)

17 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP

18 A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD

19 B ,BRTD,FLUX,SSN,ATMNO

20 COMMON/TIME/IT,GMT,UTIME(24),GMTR,XLMT(24)

21 COMMON / CON / D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]CURMUF.FOR;1

14 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

15 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

16 2HTR(50), FNSQ(50)

17 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,

18 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

19 2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S

20 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX

21 COMMON / CON / D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL

CURMUF.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]CURMUF.FOR;1

```
63      DO 148 K=1,KFX
64      FX(1,K) = FXE
65      FX(2,K) = FX1
66      FX(3,K) = FX2
67      148 CONTINUE
68      C
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]CURMUF.FOR;1

```
63      C
```

Number of difference sections found: 2
Number of difference records found: 12

DECRED.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
12      C NUMNAM, NUPROC, MAXMET
13      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
14      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
15      2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
16      COMMON /ES /FS (3, 5), HS (5)
17      COMMON /FRQ /FREL (29), FREQ
18      COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
12      C NUMNAM, NUPROC, MAXMET, mspec, m100
13      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
14      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
15      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
16      COMMON /ES /FS (3, 5), HS (5)
17      COMMON / FRQ / FREL(29), FREQ, JMODE
18      COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
24      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
25      COMMON / MFAC / F2M3(5),HPF2(5),ZENANG(5),ZENMAX(5),IEDP,FSECV(3)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
24      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
25      COMMON / MFAC / F2M3(5),HPF2(5),ZENANG(5),ZENMAX(5),IEDP,FSECV(3)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
33      COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
34      COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
33      COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
34      COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

DECRED.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
37      3 DELPEN(3,3)
38      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
39      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
40      B , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
41      COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
37      3 DELPEN(3,5)
38      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
39      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
40      2HTR(50), FNSQ(50)
41      COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
44      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM
45      COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL, SLS
46      1, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF
47      COMMON /ZON /ABPS (7), CREL (7), EFF (7), FLDST(7), GRLOS(7),
48      1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
49      2 SPRO (7), TGAIn (7), TIMED (7), TLOSS (7), B (7), FSLOS (7)
50      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
44      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
45      COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
46      1, SPR, SU, SUS, XNOISE, ZNOISE, NF
47      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
48      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
49      2 SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
50      3 OBF(7), NMODE(7), TLLOW(7), TLHGH(7)
51      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
158      115 READ(LU61,1500) METHOD, NPAGO
159      C.....TERMINATE EXECUTION IF METHOD .LE. 0 OR .GT. MAXIMUM METHOD
160      C.....HOWEVER, A "QUIT" CARD IS REQUIRED AS THE LAST CONTROL CARD
161      IF(METHOD) 120, 120, 122
162      122 IF(METHOD - MAXMET) 125, 125, 120
163      120 ITRUN = 0
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

```
159      115 READ(LU61,1500) METHOD, NPAGO, mspec
160      C.....TERMINATE EXECUTION IF METHOD .LE. 0 OR .GT. MAXIMUM METHOD
161      C.....HOWEVER, A "QUIT" CARD IS REQUIRED AS THE LAST CONTROL CARD
162      IF(METHOD - MAXMET) 125, 125, 120
163      120 ITRUN = 0
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DECRED.FOR;1

```
241      IF(SUNSP(ISSNP1)) 217, 218, 217
242      217 MORES = 1
```

DECRED.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DECRED.FOR;1

241 IF(SUNSP(1 SSNP1)) 217, 218, 217

242 217 MORES = 1

Number of difference sections found: 7

Number of difference records found: 25

DIREAD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]DIREAD.FOR;1

9 1500 FORMAT('1',80('X'),/, ' N O T E - THE FREEFORM INPUT PROCESSOR ',

10 A 'IS NOT DEVELOPED',/,1X,80('X'),/, ' INPUT MUST CONSIST OF ',

11 B 'FORMATTED CARD IMAGES')

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]DIREAD.FOR;1

9 1500 FORMAT(1H1,80('X'),/, ' N O T E -THE FREEFORM INPUT PROCESS',

10 A 'OR IS NOT DEVELOPED',/,1X,80('X'),/, ' INPUT MUST CONSIST OF ',

11 B 'FORMATTED CARD IMAGES')

Number of difference sections found: 1

Number of difference records found: 2

EF1VAR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]EF1VAR.FOR;1

11 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL

12 2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO

13 COMMON/TIME/IT,GMT,UTIME(24)

14 COMMON /All /GAMMA (6)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]EF1VAR.FOR;1

11 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

12 2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S

13 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX

14 COMMON /All /GAMMA (6)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]EF1VAR.FOR;1

18 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI

19 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM

20 2, KFX

21 COMMON /GEOG /GY (5), RAT (5), GMDIP (5)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]EF1VAR.FOR;1

18 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

19 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

20 2HTR(50), FNSQ(50)

21 COMMON /GEOG /GY (5), RAT (5), GMDIP (5)

Number of difference sections found: 2

Number of difference records found: 6

ESIND.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESIND.FOR;1

```
12      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
13      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
14      2, KFX
15      IF (KM .LT. 1) GO TO 105
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESIND.FOR;1

```
12      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
13      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
14      2HTR(50), FNSQ(50)
15      IF (KM .LT. 1) GO TO 105
```

Number of difference sections found: 1

Number of difference records found: 3

ESMOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1

```
8      C
9      COMMON/SIGD/ DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1

```
8      C
9      COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK
10     COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),
11     A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,
12     B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,
13     C NUMNAM, NUPROC, MAXMET, mspec, ml00
14     COMMON/SIGD/ DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1

```
17     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
18     2ATD, TLONG, TLONGD
19     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
20     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
21     2, KFX, AFAC (30, 3), HNOR (3)
22     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1

```
22     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
23     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
24     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
25     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
26     2HTR(50), FNSQ(50)
27     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1

```
25     1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
26     2 SPRO (7), TGAIR (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
27     C (7),OBF(7),NMODE(7),NPROB,NREL,TLLOW(7),TLHGH(7)
28     COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL, SLS
29     1, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF
30     COMMON / FRQ / FREL(29), FREQ, JMODE
```

ESMOD.FOR (cont'd.)

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1
  30      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
  31      2 SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
  32      3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
  33      COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
  34      1, SPR, SU, SUS, XNOISE, ZNOISE, NF
  35      COMMON / FRQ / FREL(29), FREQ, JMODE
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1
  34      COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
  35      COMMON /TIME /IT, GMT, UTIME (24)
  36      C ES MODES
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1
  39      COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
  40      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
  41      C ES MODES
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1
  129     C.....UPPER DECILE - HPF
  130     ESD = FS(3,K)* SECS
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1
  134     C.....UPPER DECILE - HPF
  135     ESD = FS(3,K)* SECS
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESMOD.FOR;1
  151     CALL GAIN(1,KASANT,DEL,FREQ,STGAIN,STEFF)
  152     CALL GAIN(2,KASANT,DEL,FREQ,SRGAIN,DUMMY)
  153     EFF(IH) = DUMMY
  154     140 CONTINUE
  155     XTLOS = SFLOS + HOP*(SABPS + REF + ADX ) + (HOP -1.) * SGRLOS
  156     A      - SRGAIN - STGAIN + ASM
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESMOD.FOR;1
  156     if(mspec.ne.125)then
  157         CALL GAIN(1,KASANT,DEL,FREQ,STGAIN,STEFF)
  158         CALL GAIN(2,KASANT,DEL,FREQ,SRGAIN,DUMMY)
  159         EFF(IH) = DUMMY
  160     else
  161     c.....set gains and eff to 0 dB or unity
  162         stgain=0.
  163         srgain=0.
  164         eff(ih)=0.
  165     endif
  166     140 CONTINUE
  167     xtlos = SFLOS + HOP*(SABPS + REF + ADX ) + (HOP -1.) * SGRLOS
  168     A      - SRGAIN - STGAIN + ASM
```

Number of difference sections found: 6
Number of difference records found: 31

ESREG.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESREG.FOR;1

13 C

14 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESREG.FOR;1

13 C

14 COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK

15 COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),

16 A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,

17 B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,

18 C NUMNAM, NUPROC, MAXMET, mspec, m100

19 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESREG.FOR;1

22 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL

23 2ATD, TLONG, TLONGD

24 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI

25 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM

26 2, KFX, AFAC (30, 3), HNOR (3)

27 COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),

28 1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),

29 2 SPRO (7), TGAIN (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV

30 C (7), OBF(7), NMODE(7), NPROB, NREL, TLLOW(7), TLHGH(7)

31 COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL, SLS

32 1, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF

33 COMMON/FRQ/FREL(29),FREQ,JMODE

34 COMMON /ES /FS (3, 5), HS (5)

35 COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG

36 COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESREG.FOR;1

27 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

28 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S

29 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

30 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),

31 2HTR(50), FNSQ(50)

32 COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),

33 1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),

34 2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),

35 3 OBF(7), NMODE(7), TLLOW(7), TLHGH(7)

36 COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS

37 1, SPR, SU, SUS, XNOISE, ZNOISE, NF

38 COMMON/FRQ/FREL(29),FREQ,JMODE

39 COMMON /ES /FS (3, 5), HS (5)

40 COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG

41 COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESREG.FOR;1

39 C ,DELPEN(3,3)

40 COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESREG.FOR;1

44 C ,DELPEN(3,5)

45 COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART

ESREG.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESREG.FOR;1

78 95 CONTINUE

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESREG.FOR;1

83 c

84 c--ESREG-----nothing done here!!!-----

85 c due to RETURN above

86 c-----

87 95 CONTINUE

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESREG.FOR;1

274 CALL GAIN(1,KASANT,DEL,FREQ,DUMMY,TEFF)

275 TGAIN(IMD) = DUMMY

276 CALL GAIN(2,KASANT,DEL,FREQ,DUMMY1,DUMMY2)

277 RGAIN(IMD) = DUMMY1

278 EFF(IMD) = DUMMY2

279 Y = 0.0

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESREG.FOR;1

283 if(mspec.ne.125)then

284 CALL GAIN(1,KASANT,DEL,FREQ,DUMMY,TEFF)

285 TGAIN(IMD) = DUMMY

286 CALL GAIN(2,KASANT,DEL,FREQ,DUMMY1,DUMMY2)

287 RGAIN(IMD) = DUMMY1

288 EFF(IMD) = DUMMY2

289 else

290 c.....set gains and eff to 0. dB or unity

291 tgain(imd)=0.

292 rgain(imd)=0.

293 eff(imd)=0.

294 endif

295 Y = 0.0

Number of difference sections found: 5

Number of difference records found: 37

ESVHF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESVHF.FOR;1

15 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)

16 A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3),

17 B FX(3,5),HTR(50),FNSQ(50)

18 COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,RCNSE,REL,SL,SLS,SPR,SU

19 A ,SUS,TIMER,XADJN,XEFF,XNOIS,XTLOS,ZNOISE,NF

20 COMMON/FRQ/FREL(29),FREQ,JMODE

21 COMMON/TIME/IT,GMT,UTIME(24)

22 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESVHF.FOR;1

15 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

16 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

17 2HTR(50), FNSQ(50)

18 COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU

19 A ,SUS,XNOISE,ZNOISE,NF

ESVHF.FOR (cont'd.)

```
20      COMMON/FRQ/FREL(29),FREQ,JMODE
21      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
22      COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT
*****
*****
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]ESVHF.FOR;1

```
28      COMMON/ZON/ABPS(7),CREL(7),EFF(7),FLDST(7),GRLOS(7),HN(7),HP(7)
29      A ,PROB(7),RELY(7),RGAIN(7),SIGPOW(7),SN(7),SPRO(7),TGAIN(7),TIMED
30      B (7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7),NPROB,NREL
31      C ,TLLOW(7),TLHGH(7)
32      COMMON/SIGD/DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
*****
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]ESVHF.FOR;1

```
28      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
29      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
30      2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
31      3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
32      COMMON/SIGD/DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
*****
```

Number of difference sections found: 2
Number of difference records found: 11

F2DIS.FOR

Number of difference sections found: 0
Number of difference records found: 0

F2VAR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]F2VAR.FOR;1

```
8      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI
9      1(3,5), HI(3,5), HPRIM(30,3), HTRUE(30,3), FVERT(30,3), KM
10     2, KFX
11     COMMON /CON /AK, DCL, GAMA, PI, PI2, PIO2, BK, RZ, VOFL
12     COMMON / GEOG / GY(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5)
13     COMMON/TIME/IT,GMT,UTIME(24)
14     DATA XF1/1.1/,DELZ/2./
*****
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]F2VAR.FOR;1

```
8      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
9      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
10     2HTR(50), FNSQ(50)
11     COMMON /CON /AK, DCL, GAMA, PI, PI2, PIO2, BK, RZ, VOFL
12     COMMON / GEOG / GY(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5)
13     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
14     DATA XF1/1.1/,DELZ/2./
*****
```

Number of difference sections found: 1
Number of difference records found: 6

FDIST.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FDIST.FOR;1

```
9      COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
10     A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3,5)
11     B ,FX(3,5)
12     COMMON /CON /D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL
13     COMMON/DON/ALATD,AMIN,AMIND
14     COMMON /FRQ /FREL (29), FREQ
15     COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FDIST.FOR;1

```
9      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
10     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
11     2HTR(50), FNSQ(50)
12     COMMON /CON /D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL
13     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
14     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
15     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
16     COMMON / FRQ / FREL(29), FREQ, JMODE
17     COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FDIST.FOR;1

```
20     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
21     C      DHOP= HOP DISTANCE KM
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FDIST.FOR;1

```
22     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
23     C      DHOP= HOP DISTANCE KM
```

Number of difference sections found: 2
Number of difference records found: 9

FINDF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FINDF.FOR;1

```
32     COMMON/DON/ALATD,AMIN,AMIND
33     COMMON / FRQ / FREL(29), FREQ
34     COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FINDF.FOR;1

```
32     C LONG PATH PARAMETERS,SEE SUBR LNGPAT.
33     COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
34     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
35     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
36     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
37     COMMON / FRQ / FREL(29), FREQ, JMODE
38     COMMON /REFLX /DELFX (45, 3), HPFLX (45, 3), HTFLX (45, 3), GDFLX
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FINDF.FOR;1

```
37     3, DELPEN(3,3)
38     COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FINDF.FOR;1

```
41     3, DELPEN(3,5)
42     COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(
```

FINDF.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FINDF.FOR;1

```
43      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
44      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
45      2, KFX, AFAC (30, 3), HNOR (3)
46      COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
47      DIMENSION ITYPE(3)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FINDF.FOR;1

```
47      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
48      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
49      2HTR(50), FNSQ(50)
50      COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
51      DIMENSION ITYPE(3)
```

Number of difference sections found: 3

Number of difference records found: 11

FIXLIN.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FIXLIN.FOR;1

```
7      C NUMNAM, NUPROC, MAXMET
8      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FIXLIN.FOR;1

```
7      C NUMNAM, NUPROC, MAXMET, mspec, m100
8      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

Number of difference sections found: 1

Number of difference records found: 1

FLOLIN.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FLOLIN.FOR;1

```
7      C NUMNAM, NUPROC, MAXMET
8      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FLOLIN.FOR;1

```
7      C NUMNAM, NUPROC, MAXMET, mspec, m100
8      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FLOLIN.FOR;1

```
19     120 WRITE(LUO,IFMT) VAR(IMUF), (VAR(I),I=1,ND), KLINE(LIN)
20     RETURN
21     130 WRITE(LUO,IFMT) VAR(IMUF), (VAR(I),I=1,JFREQ), (NDASH,J=1,JDASH),
22     A KLINE(LIN)
23     140 RETURN
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FLOLIN.FOR;1

```
19     120 WRITE(LUO,IFMT,Iostat=IERRSTAT) VAR(IMUF), (VAR(I),I=1,ND),
20     A KLINE(LIN)
21     C RETURN
22     GO TO 140
23     130 WRITE(LUO,IFMT,Iostat=IERRSTAT) VAR(IMUF), (VAR(I),I=1,JFREQ)
24     A , (NDASH,J=1,JDASH),KLINE(LIN)
25     140 RETURN
```

FLOLIN.FOR (cont'd.)

Number of difference sections found: 2
Number of difference records found: 7

FNORML.FOR

Number of difference sections found: 0
Number of difference records found: 0

FOBBY.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FOBBY.FOR;1

```
9      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GLD,
10     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
11     2ATD, TLONG, TLONGD
12     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
13     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
14     2 , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
15     COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
16     DO 650 IA=1,NANG
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FOBBY.FOR;1

```
9      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
10     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
11     2 TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
12     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
13     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
14     2HTR(50), FNSQ(50)
15     COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
16     DO 650 IA=1,NANG
```

Number of difference sections found: 1
Number of difference records found: 7

FRQCOM.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FRQCOM.FOR;1

```
10     COMMON/TIME/ IT,GMT,UTIME(24)
11     DIMENSION FREA(13)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FRQCOM.FOR;1

```
10     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
11     DIMENSION FREA(13)
```

Number of difference sections found: 1
Number of difference records found: 1

FVHF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FVHF.FOR;1

```
13     COMMON / TON / ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL,
14     A SLS, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF
15     COMMON/FRQ/FREL(29),FREQ,JMODE
16     COMMON/TIME/IT,GMT,UTIME(24)
17     COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT
```

FVHF.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FVHF.FOR;1

```
13      COMMON / TON / ADJ, ADS, GNOS, GOT, PWRDB, REL, SL,
14      A SLS, SPR, SU, SUS, XNOISE, ZNOISE, NF
15      COMMON/FRQ/FREL(29),FREQ,JMODE
16      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
17      COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FVHF.FOR;1

```
22      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
23      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FVHF.FOR;1

```
22      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
23      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]FVHF.FOR;1

```
27      COMMON/ZON/ABPS(7),CREL(7),EFF(7),FLDST(7),GRLOS(7),HN(7),HP(7)
28      A ,PROB(7),RELY(7),RGAIN(7),SIGPOW(7),SN(7),SPRO(7),TGAIN(7),TIMED
29      B (7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7),NPROB,NREL
30      C ,TLLOW(7),TLHGH(7)
31      COMMON/SIGD/DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]FVHF.FOR;1

```
27      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
28      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
29      2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
30      3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
31      COMMON/SIGD/DSL,ASM,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE
```

Number of difference sections found: 3
Number of difference records found: 9

GAIN.FOR

Number of difference sections found: 0
Number of difference records found: 0

GENFAM.FOR

Number of difference sections found: 0
Number of difference records found: 0

GENION.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GENION.FOR;1

```
19      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GLD,
20      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
21      2ATD, TLONG, TLONGD
22      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
23      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
24      2 , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
25      DIMENSION HTE(10),HPE(10)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GENION.FOR;1

```
19      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
20      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
21      2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
22      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
```

GENION.FOR (cont'd.)

```
23      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
24      2HTR(50), FNSQ(50)
25      DIMENSION HTE(10),HPE(10)
*****
                Number of difference sections found: 1
                Number of difference records found: 6
```

GENOIS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GENOIS.FOR;1

```
3      C      THIS ROUTINE COMPUTES THE COMBINED NOISE DISTRIBUTION
4      C
5      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
6      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
7      2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
8      COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
9      COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, ZCNSE, REL, SL, SLS
10     1, SPR, SU, SUS, TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
11     COMMON/FRQ/FREL(29),FREQ
12     COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GENOIS.FOR;1

```
3      C      THIS ROUTINE COMPUTES THE COMBINED NOISE DISTRIBUTION - as
prescribed
```

```
4      C      in ITS Report 87-212 "Updated Noise Model for use in IONCAP"
5      C
6      CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
7      COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),
8      A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,
9      B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,
10     C NUMNAM, NUPROC, MAXMET, mspec, m100
11     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
12     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
13     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
14     COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
15     COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
16     1, SPR, SU, SUS, XNOISE, ZNOISE, NF
17     COMMON / FRQ / FREL(29), FREQ, JMODE
18     COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GENOIS.FOR;1

```
15     COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
16     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
17     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
18     B ,KFX,AFAC(30,3),HNOR(3),FX(3,5)
19     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GENOIS.FOR;1

```
21     COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
22     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
23     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
24     2HTR(50), FNSQ(50)
25     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

GENOIS.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GENOIS.FOR;1

```
24      1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
25      2 SPRO (7), TGAIn (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
26      C (7), OBF (7), NMODE (7)
27      DIMENSION XNINT (4)
28      C.....MAN-MADE NOISE LEVELS
29      DATA XNINT /125., 136., 148., 164./
30      C.....BUT COMBINATION IS NOT
31      C.....CALCULATION OF NOISE LEVEL IS ITSA-1
32      C.....ATNU, ATNY ARE DB .GT. KTB FOR 1 MHZ
33      C.....ATNZ, ATNX ARE DB .GT. KTB FOR FREQ
34      C.....ATNOS, GNOS, XNOIS ARE DB .LT. 1 WATT IN 1 HZ BAND AT FREQ
35      C.....UPPER LIMIT IS 55 MHZ FOR NOISE
36      DUME = AMIN1(FREQ,55.)
37      MAN=NOISE
38      C FREQUENCY DEPENDENCE ATMOSPHERIC NOISE
39      IF(F2D(1,1,1)) 85, 90, 90
40      C.....NO IONOSPHERIC LONG TERM DATA BASE FILE
41      C.....FORCE MAN-MADE NOISE OR GALACTIC NOISE
42      85 ATNOS = 204.
43      DUA = 9.
44      DLA = 7.
45      SMA = 3.
46      SUA = 1.5
47      SLA = 1.5
48      GO TO 95
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GENOIS.FOR;1

```
30      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
31      2 SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
32      3 OBF(7), NMODE(7), TLLOW(7), TLHGH(7)
33      CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
34      DIMENSION XNINT (4)
35      C.....MAN-MADE NOISE LEVELS
36      DATA XNINT /76.8, 72.5, 67.2, 53.6/
37      C
38      DATA DFAC,BFAC,CFAC /7.87384, 30.99872, 5.56765/
39      C
40      C      7.87384=SQRT(2 * 1.282**2 * 4.34294**2)
41      C
42      C      30.99872=(1.282**2)*(4.34294**2)
43      C
44      C      5.56765=4.34294 * 1.282
45      C
46      C.....DATA ARE FA VALUES AT 1 MHZ
47      C
48      C.....ATNU, ATNY ARE DB .GT. KTB FOR 1 MHZ
49      C.....ATNZ, ATNX ARE DB .GT. KTB FOR FREQ
50      C.....ATNOS, GNOS, XNOIS ARE DB .GT. KTB FOR ALL CALCULATIONS
51      C.....AND ARE CONVERTED TO DBW(1 HZ BWDTH) AT END OF ROUTINE
52      C.....UPPER LIMIT IS 55 MHZ FOR NOISE
53      DUME=AMIN1(FREQ,55.)
54      MAN=NOISE
55      C
```

GENOIS.FOR (cont'd.)

```
56 C      FREQUENCY DEPENDENT ATMOSPHERIC NOISE
57 C
58       IF (F2D(1,1,1)) 85,90,90
59 C.....NO IONOSPHERIC LONG TERM DATA BASE FILE
60 C.....FORCE MAN-MADE NOISE OR GALACTIC NOISE
61       85 ATNOS=204.
62       DUA=9.
63       DLA=7.
64       SMA=3.
65       SUA=1.5
66       SLA=1.5
67       GO TO 95
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GENOIS.FOR;1

```
53 C.....BEGIN OF INTERPOLATION ON LOCAL TIME
54       SLOP = ABS(CC-TM)/4.
55       ATNOS = - (ATNZ + (ATNX - ATNZ) * SLOP) + 204.
56       DUA= DU +(DX-DU)*SLOP
57       DLA= DL +(DQ-DL)*SLOP
58       SMA= SIGM+ (SIGZ-SIGM)*SLOP
59       SUA= SIGU +(SIGX-SIGU)*SLOP
60       SLA= SIGL+(SIGSQ-SIGL)* SLOP
61 C.....END OF INTERPOLATION ON LOCAL TIME
62 C GALACTIC NOISE
63       95 IF(FREQ - FI(3,KFX)) 100, 100, 105
64 C.....GALACTIC NOISE DOES NOT PENETRATE
65       100 GNOS = 204.
66       GO TO 110
67       105 GNOS = 165. + 9.555 * ALOG(FREQ / 3.)
68       110 DUG = 2.
69       DLG =2.
70       SMG = .5
71       SUG = .2
72       SLG = .2
73 C MAN MADE NOISE
74       MAN=NOISE
75       XNOIS = MAN
76       MA = IABS(MAN)
77       ZNOISE=XNOIS
78       IF(MAN) 120, 114, 115
79 C.....INDICATES -164 ON USER INPUT
80       114 MA = 4
81       GO TO 120
82 C.....ACTUAL VALUE IF POSITIVE ON USER INPUT
83       115 XNOIS = XNOIS + 12.160 * ALOG(FREQ / 3.)
84       MA= -MAN
85       GO TO 125
86 C.....NEGATIVE ON USER INPUT INDICATES INDEX
87       120 MA = MIN0(4,MA)
88       XNOIS = XNINT(MA) + 12.160 * ALOG(FREQ/3.)
89       ZNOISE = XNINT(MA)
90       MA= -XNINT(MA)
91       125 DUM =9.
92       DLM =7.
93       SUM=1.5
94       SMM=3.
95       SLM=1.5
```

GENOIS.FOR (cont'd.)

```

96 C.....RECEIVER ANTENNA EFFICIENCY
97 CALL GAIN(2,KASANT,0.0,FREQ,GDUM,REFF)
98 XEFF = REFF
99 ZEFF=XEFF
100 C.....SET ARRAY FOR ALL POSSIBLE MODES
101 DO 196 IM=1,6
102 196 EFF(IM) = XEFF
103 C.....NOW DETERMINATION OF NOISE LEVEL IS ITS-78(HFMUFES4)
104 C.....SWITCH TO DB .GT. WATT
105 ATNOS = - ATNOS
106 GNOS = - GNOS
107 XNOIS = - XNOIS
108 C ADD THE NOISES (RANDOM PHASE APROXIMATION=ADD THE POWER IN WATTS)
109 C.....MEDIAN
110 XRNSE= 4.343*ALOG((10.** (ATNOS*.1)) + (10.** (GNOS*.1))
111 A +(10.** (XNOIS*.1)))
112 C CALCULATE THE DECILES AND VARIANCE BY EQ. 37, P. 29 OF THE THEORY OF
113 C ERROR BY YARDLEY BEERS, MCGRAW HILL.
114 C
115 C.....UPPER DECILE
116 DU= ABS(4.343*ALOG(10.** ((ATNOS+DUA)*.1) + 10.** ((GNOS+DUG)*.1)
117 A +10.** ((XNOIS+DUM)*.1))- XRNSE)
118 C.....LOWER DECILE
119 DL= ABS( 4.343 *ALOG(10.** ((ATNOS+DLA)*.1) +10.** ((GNOS+DLG)*.1)
120 A +10.** ((XNOIS+DLM)*.1)) -XRNSE)
121 IF(ITRUN - 8) 205, 210, 205
122 205 QPA = 10. ** ((ATNOS - XRNSE) * .1)
123 QPG = 10.** ((GNOS -XRNSE)*.1)
124 C.....PREDICTION ERRORS
125 C.....SIGM IS MEDIAN, SIGU IS UPPER AND SIGL IS LOWER
126 QPM = 10.** ((XNOIS-XRNSE)*.1)
127 SIGM= SQRT((QPA*SMA)**2 +(QPG*SMG)**2 +(QPM*SMM)**2)
128 SIGU= SQRT((DUA*SUA*QPA**2/DU)**2 +(DUG*SUG*QPG**2/DU)**2
129 A +(DUM*SUM*QPM**2/DU)**2)
130 SIGL = SQRT((DLA*SLA*QPA**2/DL)**2 +(DLG*SLG*QPG**2/DL)**2
131 A + (DLM * SLM * QPM ** 2 / DL) ** 2)
132 C RCVR SITE NOISE = TOTAL NOISE + ANTENNA EFFICENCY (ADDED TO SIGNAL
133 C WITH GAIN)
134 210 RCNSE = XRNSE + XEFF
135 ZCNSE=RCNSE
136 ATMNO=ATNOS
137 XADJN=1.
138 XNOISE=XNOIS
139 ATMO=ATNOS
140 RETURN
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GENOIS.FOR;1
72 C.....BEGIN INTERPOLATION ON LOCAL TIME
73 SLOP=ABS(CC-TM)/4.
74 ATNOS=ATNZ+(ATNX-ATNZ)*SLOP
75 DUA=DU+(DX-DU)*SLOP
76 DLA=DL+(DQ-DL)*SLOP
77 SMA=SIGM+(SIGZ-SIGM)*SLOP
78 SUA=SIGU+(SIGX-SIGU)*SLOP
79 SLA=SIGL+(SIGSQ-SIGL)*SLOP

```

GENOIS.FOR (cont'd.)

```

80 C.....END OF INTERPOLATION ON LOCAL TIME
81 C
82 C      (DUA/DFAC)**2=(DUA/1.282)**2/(2*4.34294**2)
83 C      =(DUA/SQRT(2*1.282**2*4.34294**2))**2
84 C      =(DUA/7.87384)**2
85 C
86 95 AU=EXP((DUA/DFAC)**2+(ATNOS/4.34294))
87 VU=AU*AU*(EXP(DUA*DUA/BFAC)-1.)
88 AL=EXP((DLA/DFAC)**2+(ATNOS/4.34294))
89 C
90 C      DLA*DLA/BFAC=(DLA/1.282)**2/(4.34294)**2
91 C      =DLA**2/30.99872
92 C
93 VL=AL*AL*(EXP(DLA*DLA/BFAC)-1.)
94 C
95 C      GALACTIC NOISE
96 C
97 IF (FREQ-FI(3,KFX)) 100,100,105
98 C.....GALACTIC NOISE DOES NOT PENETRATE
99 100 GNOS=0.
100 GO TO 110
101 105 GNOS=52.-23.*ALOG10(FREQ)
102 110 DUG=2.
103 AT=EXP((DUG/DFAC)**2+(GNOS/4.34294))
104 AU=AU+AT
105 VU=VU+AT*AT*(EXP(DUG*DUG/BFAC)-1.)
106 DLG=2.
107 AT=EXP((DLG/DFAC)**2+(GNOS/4.34294))
108 AL=AL+AT
109 VL=VL+AT*AT*(EXP(DLG*DLG/BFAC)-1.)
110 SMG=.5
111 SUG=.2
112 SLG=.2
113 C
114 C      MAN MADE NOISE
115 C
116 MAN=NOISE
117 XNOIS=MAN
118 MA=IABS(MAN)
119 ZNOISE=XNOIS
120 IF (MAN) 120,114,115
121 C.....INDICATES -164 ON USER INPUT
122 114 MA=4
123 GO TO 120
124 C.....CONVERT 3 MHZ DB .LT. 1 WATT INPUT VALUE TO FA AT 1 MHZ
125 115 XNOIS=204.0-XNOIS+13.22
126 C.....OBTAIN FA AT DESIRED FREQUENCY
127 XNOIS=XNOIS-27.7*ALOG10(FREQ)
128 GO TO 125
129 C.....NEGATIVE ON USER INPUT INDICATES INDEX
130 120 MA=MINO(4,MA)
131 CONN=27.7
132 IF (MA.EQ.4) CONN=28.6
133 XNOIS=XNINT(MA)-CONN*ALOG10(FREQ)
134 ZNOISE=204.0-XNINT(MA)+13.22
135 125 DUM=9.7
136 AT=EXP((DUM/DFAC)**2+(XNOIS/4.34294))
137 AU=AU+AT

```

GENOIS.FOR (cont'd.)

```

138      VU=VU+AT*AT*(EXP(DUM*DUM/BFAC)-1.)
139      DLM=6.
140      AT=EXP((DLM/DFAC)**2+(XNOIS/4.34294))
141      AL=AL+AT
142      VL=VL+AT*AT*(EXP(DLM*DLM/BFAC)-1.)
143      SUM=1.5
144      SMM=5.4
145      SLM=1.5
146      CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
147      C.....RECEIVER ANTENNA EFFICIENCY
148          if(mspec.eq.125)then
149      c.....set rec eff to 0. dB or unity
150          reff=0.
151      else
152          CALL GAIN(2,KASANT,0.0,FREQ,GDUM,REFF)
153      endif
154      C.....SET ARRAY FOR ALL POSSIBLE MODES
155          DO 196 IM=1,6
156      196 EFF(IM) = REFF
157      CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
158      C.....NOW DETERMINATION OF NOISE LEVEL IS ITS-78 (HFMUFES4)
159      C.....SWITCH TO DB .GT. WATT
160          ATNOS=ATNOS-204.
161          GNOS=GNOS-204.
162          XNOIS=XNOIS-204.
163          SIGTSQ=ALOG(1.+VU/(AU*AU))
164          XRNSE=4.34294*(ALOG(AU)-SIGTSQ/2.)-204.
165      C.....UPPER DECILE
166      C
167      C      CFAC=4.34294*1.282
168      C      =5.56765
169      C
170          DU=CFAC*SQRT(SIGTSQ)
171          SIGTSQ=ALOG(1.+VL/(AL*AL))
172      C.....LOWER DECILE
173          DL=CFAC*SQRT(SIGTSQ)
174          IF (ITRUN-8) 205,210,205
175      205 QPA=10.**((ATNOS-XRNSE)*0.1)
176          QPG=10.**((GNOS-XRNSE)*0.1)
177      C.....PREDICTION ERRORS
178      C.....SIGM IS MEDIAN, SIGU IS UPPER AND SIGL IS LOWER
179          QPM=10.**((XNOIS-XRNSE)*0.1)
180          SIGM=SQRT((QPA*SMA)**2+(QPG*SMG)**2+(QPM*SMM)**2)
181      C
182      C      0.23026=1.0/4.34294
183      C
184          PV=QPA*EXP((DUA-DU)*0.23026)
185          SIGU=(PV*SUA)**2+((PV-QPA)*SMA)**2
186          PV=QPG*EXP((DUG-DU)*0.23026)
187          SIGU=SIGU+(PV*SUG)**2+((PV-QPG)*SMG)**2
188          PV=QPM*EXP((DUM-DU)*0.23026)
189          SIGU=SQRT(SIGU+(PV*SUM)**2+((PV-QPM)*SMM)**2)
190          PV=QPA*EXP((DLA-DL)*0.23026)
191          SIGL=(PV*SLA)**2+((PV-QPA)*SMA)**2
192          PV=QPG*EXP((DLG-DL)*0.23026)
193          SIGL=SIGL+(PV*SLG)**2+((PV-QPG)*SMA)**2
194          PV=QPM*EXP((DLM-DL)*0.23026)
195          SIGL=SQRT(SIGL+(PV*SLM)**2+((PV-QPM)*SMM)**2)

```

GENOIS.FOR (cont'd.)

```
196 C
197 C      RCVR SITE NOISE = TOTAL NOISE + ANTENNA EFFICENCY (ADDED TO
198 C      SIGNAL WITH GAIN)
199 C
200 CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
201      210 RCNSE = XRNSE + REFF
202      XNOISE=XNOIS
203 CQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ
204      RETURN
```

Number of difference sections found: 4
Number of difference records found: 188

GEOM.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GEOM.FOR;1

```
11      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
12      2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
13      COMMON /ION/ IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GEOM.FOR;1

```
11      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
12      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
13      COMMON /ION/ IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GEOM.FOR;1

```
16      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
17      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
18      2, KFX
19      COMMON/GEOG/ GYZ(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5), ARTIC(5),
20      1 SIGPAT(5), EPSPAT(5)
21      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
22      COMMON / OUTLAB / LABEL(11), LAYTYP(5), IEAST, INORTH, ISOUTH,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GEOM.FOR;1

```
16      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
17      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
18      2HTR(50), FNSQ(50)
19      COMMON/GEOG/ GYZ(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5), ARTIC(5),
20      1 SIGPAT(5), EPSPAT(5)
21      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
22      COMMON / OUTLAB / LABEL(11), LAYTYP(5), IEAST, INORTH, ISOUTH,
```

Number of difference sections found: 2
Number of difference records found: 8

GEOTIM.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GEOTIM.FOR;1

```
1      SUBROUTINE GEOTIM(ITIM,JT)
2      C
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GEOTIM.FOR;1

```
1      SUBROUTINE GEOTIM(JT)
2      C
```

GEOTIM.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GEOTIM.FOR;1

```
6      COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,
7      1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
8      2 TLAT, TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
9      COMMON / GEOG / GYZ(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5),
10     1 ARTIC(5), SIGPAT(5), EPSPAT(5)
11     COMMON / RON / CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5),
12     1 YI(3,5), HI(3,5), HPRIM(30,3), HTRUE(30,3), FVERT(30,3), KM, KFX,
13     2 AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
14     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
15     CKC = JT
16     C.....ITIM IS SPECIFIED ON THE "TIME" CONTROL CARD.
17     C.....IF ITIM .LT.0 USE LMT SO CALCULATE UT HERE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GEOTIM.FOR;1

```
6      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
7      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
8      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
9      COMMON / GEOG / GYZ(5), RAT(5), GMDIP(5), CLCK(5), ABIY(5),
10     1 ARTIC(5), SIGPAT(5), EPSPAT(5)
11     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), PD(5), FI(3,5), YI(3,5),
12     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
13     2HTR(50), FNSQ(50)
14     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
15     CKC = JT
16     C.....IITIM IS SPECIFIED ON THE "TIME" CONTROL CARD.
17     C.....IF ITIM .LT.0 USE LMT SO CALCULATE UT HERE
```

Number of difference sections found: 2
Number of difference records found: 12

GETANT.FOR

Number of difference sections found: 0
Number of difference records found: 0

GETHP.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GETHP.FOR;1

```
8      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GLD,
9      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
10     2ATD, TLONG, TLONGD
11     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
12     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
13     2 , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
14     FR = FXX * FXX
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GETHP.FOR;1

```
8      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
9      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
10     2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
11     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
12     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
13     2HTR(50), FNSQ(50)
14     FR = FXX * FXX
```

Number of difference sections found: 1
Number of difference records found: 6

GETKMF.FOR

Number of difference sections found: 0
Number of difference records found: 0

GETTOP.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GETTOP.FOR;1

```
7      COMMON/FRQ/FREL(29),FREQ
8      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
9      COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
10     A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)
11     B ,FX(3,5)
12     DIMENSION FPE(3)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GETTOP.FOR;1

```
7      COMMON / FRQ / FREL(29), FREQ, JMODE
8      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
9      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
10     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
11     2HTR(50), FNSQ(50)
12     DIMENSION FPE(3)
```

Number of difference sections found: 1
Number of difference records found: 5

GMLOSS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GMLOSS.FOR;1

```
5      COMMON/DON/ALATD,AMIN,AMIND
6      COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
7      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GMLOSS.FOR;1

```
5      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
6      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
7      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
8      COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
9      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GMLOSS.FOR;1

```
12     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,3)
13     COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
14     1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
15     2 SPRO (7), TGAIN (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
16     C (7),OBF(7),NMODE(7)
17     C.....PRESET ALL ARRAYS
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GMLOSS.FOR;1

```
14     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,5)
15     COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
16     1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
17     2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
18     3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
19     C.....PRESET ALL ARRAYS
```

Number of difference sections found: 2
Number of difference records found: 9

GPHBOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]GPHBOD.FOR;1

14 COMMON / TIME / ITDUM, GMT, UTIME(24), GMTR, XLMT(24)

15 CHARACTER IHR(40)*2, IBLANK*6, ISYMBL*6, JSYMBL*6, KSYMBL*6,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]GPHBOD.FOR;1

14 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX

15 CHARACTER IHR(40)*2, IBLANK*6, ISYMBL*6, JSYMBL*6, KSYMBL*6,

Number of difference sections found: 1

Number of difference records found: 1

HFMUFS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

6 COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

6 COMMON / ALPHA / IMON(12), IRCVR(2), ITRAN(2), MODE(13),

7 A MODER(13), MODVHF(13), IRLAT, IRLONG, ITLAT, ITLONG, NYEAR

8 CHARACTER IMON*3

9 CHARACTER IRCVR*10, ITRAN*10, MODE*2, MODER*2, MODVHF*2, IRLAT*1,

10 A IRLONG*1, ITLAT*1, ITLONG*1, NYEAR*5

11 COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

9 C NUMNAM, NUPROC, MAXMET

10 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

14 C NUMNAM, NUPROC, MAXMET, mspec, ml00

15 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

15 COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,

16 1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,

17 2 TLAT, TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, ATMNO

18 COMMON / FRQ / FREL(29), FREQ

19 COMMON / ION / IANT(3.2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

20 COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,

21 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

22 2 TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S

23 COMMON / FRQ / FREL(29), FREQ, JMODE

24 COMMON / ION / IANT(3.2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

22 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)

23 COMMON / MUFS / EMUF(24), F1MUF(24), F2MUF(24), ESMUF(24),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

27 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS

28 COMMON / MUFS / EMUF(24), F1MUF(24), F2MUF(24), ESMUF(24),

HFMUFS.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

28 C.....START OF PROGRAM

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;J

33 COMMON / SSP / SUN(2,12), MONTH

34 COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS

35 A ,XNOISE,ZNOISE,NF

36 common/indicez/ispot,iseaz,ifqn,iour,inmmd(11,24,4,2)

37 character*13 filnam

38 data filnam/'xmtrddddd.alm'/

39 C.....START OF PROGRAM

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

65 C.....BEGIN HOUR LOOP

66 DO 400 JT = IHRO,IHRE,IHRS

67 JTX = JT

68 C.....CONVERT UT TO LMT, ETC.

69 CALL GEOTIM(ITIM,JT)

70 C.....WANT TO USE LONG TERM COEFFICIENTS

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

76 if(filnam(1:9).ne.itran(1)(1:9))then

77 if(filnam(1:9).ne.'xmtrddddd')then

78 if(mspec.eq.125)then

79 close(m100)

80 write(luo,129)((ispot,iseaz,iour,(inmmd(ifqn,iour,

81 + iseaz,ispot),ifqn=1,11),iour=1,24),iseaz=1,4),ispot=1,2)

82 129 format(8(1x,'ispot,iseaz,iour, (>>--num modes(ifqn=1,...',

83 + '11)---->>'),/,24(2x,3(i2,3x),3x,11i3,/),/))

84 endif

85 endif

86 filnam(1:9)=itran(1)(1:9)

87 if(mspec.eq.125)then

88 c.....Power set to 1 Watt

89 pwr=.001

90 pwrdb=0.

91 open(m100,file=filnam,status='new',form='unformatted')

92 write(m100)tlatd,itlat,tlongd,itlong,rlatd,irlat,

93 + rlongd,irlong,btrd,gcdkm,rsn,lufp,nyear

94 write(m100)ssn

95 write(m100)month

96 endif

97 ssnsav=ssn

98 monsav=month

99 do 128 ispot=1,2

100 do 128 iseaz=1,4

101 do 128 iour=1,24

102 do 128 ifqn=1,11

103 128 inmmd(ifqn,iour,iseaz,ispot)=-1

104 ispot=1

105 iseaz=1

106 endif

107 if(ssn.ne.ssnsav)then

108 if(mspec.eq.125)write(m100)ssn

109 ssnsav=ssn

110 ispot=ispot+1

111 endii

HFMUFS.FOR (cont'd.)

```
112      if(month.ne.monsav)then
113          if(mspec.eq.125)write(m100)month
114          monsav=month
115          iseaz=iseaz+1
116          if(iseaz.gt.4)iseaz=iseaz-4
117      endif
118  C.....BEGIN HOUR LOOP
119      DO 400 JT = IHRO,IHRE,IHRS
120          iour=jt
121          JTX = JT
122  C.....CONVERT UT TO LMT, ETC.
123      CALL GEOTIM(JT)
124      if(mspec.eq.125)write(m100)gmt
125  C.....WANT TO USE LONG TERM COEFFICIENTS
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

```
110  C.....FORCE LONG PATH MODEL IF PATH LENGTH .GT. SPECIFIED LIMIT
111      215 IF(GCDKM - GCDLNG) 220, 240, 240
112  C.....SHORT PATH MODEL (CHASE MODES)
113      220 IF(METHOD - 21) 230, 245, 230
114      230 CALL LUFFY
115          CALL SETLUF
116          GO TO 300
117      240 IF(METHOD - 22) 245, 230, 245
118  C.....LONG PATH MODEL
119      245 CALL LNGLUF
120          CALL SETLUF
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

```
165      215 IF(METHOD.EQ.22)THEN
166  C.....FORCE SHORT PATH MODEL
167          IPFG=100
168      ELSE IF(METHOD.EQ.21)THEN
169  C.....FORCE LONG PATH MODEL
170          IPFG=200
171      ELSE
172  C.....FORCE LONG PATH MODEL IF PATH LENGTH .GT. SPECIFIED LIMIT
173          IPFG=100
174          IF(GCDKM.GE.GCDLNG)IPFG=200
175      ENDIF
176      CALL LUFFY(IPFG)
177      CALL SETLUF
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

```
124      255 IF(GCDKM-GCDLNG) 256,257,257
125      256 CALL SETLUF
126          GO TO 260
127      257 CALL GETLUF
128      260 CONTINUE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

```
181      255 IPFG=300
182          IF(GCDKM.GE.GCDLNG)IPFG=400
183          CALL LUFFY(IPFG)
184      260 CONTINUE
```

HFMUFS.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

131 300 IF(ITOUT - 7) 310, 305, 310

132 C.....OUTPUT PRINTED LINES DEPENDENT ON METHOD

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

187 300 if(mspec.eq.125)go to 400

188 IF(ITOUT - 7) 310, 305, 310

189 C.....OUTPUT PRINTED LINES DEPENDENT ON METHOD

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]HFMUFS.FOR;1

215 STOP

216 1504 FORMAT('1','*****END OF RUN*****',5X,'IONCAP ',F5.2)

217 END

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]HFMUFS.FOR;1

272 if(mspec.eq.125)then

273 write(luo,129)(((ispot,iseaz,iour,(inmmd(ifqn,iour,

274 + iseaz,ispot),ifqn=1,11),iour=1,24),iseaz=1,4),ispot=1,2)

275 close(ml00)

276 endif

277 STOP

278 1504 FORMAT(1H1,'*****END OF RUN*****',5X,'IONCAP ',F5.2)

279 END

Number of difference sections found: 10

Number of difference records found: 91

INMOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

1 SUBROUTINE INMOD(JFX)

2 C.....THIS SUBROUTINE ADDS AN OVER-THE-MUF MODE

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

1 SUBROUTINE INMOD(JFX,iflg)

2 C.....THIS SUBROUTINE ADDS AN OVER-THE-MUF MODE

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

5 COMMON / CON / D2R, DCL, GAMMA, PI, PI2, PIO2, R2D, RZ, VOFL

6 C..... /DON/ IS TRUNCATED

7 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD

8 A, Z2DUM(23)

9 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

5 C

6 COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),

7 A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,

8 B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,

9 C NUMNAM, NUPROC, MAXMET, mspec, ml00

10 COMMON / CON / D2R, DCL, GAMMA, PI, PI2, PIO2, R2D, RZ, VOFL

11 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,

12 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

13 2 TLATD,TLONG,TLONGD,BTRD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S

14 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

INMOD.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

```
18      COMMON/RON/ CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5)
19      A ,HI(3,5),HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3)
20      B ,HNOR(3)
21      COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13),
22      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
23      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

```
23      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
24      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
25      2HTR(50), FNSQ(50)
26      COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13),
27      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
28      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

```
27      A HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
28      B SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
29      C OBF(7), NMODE(7), NPROB, NREL, TLLOW(7), TLHGH(7)
30      C
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

```
32      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
33      2 SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
34      3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
35      C
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

```
33      C.....RETURN IF THERE ALREADY IS A MODE
34      IF( NHP(JFX) ) 110,110,105
35      C   YES,
36      105 CONTINUE
37      RETURN
38      C.....THERE IS NO MODE PRESENT, CHECK IF FREQUENCY IS ABOVE CIRCUIT MUF
39      110 IF(FREQ - ALLMUF(IT) + EPS) 120,115,115
40      C.....INSERT MUF MODE IF FREQUENCY IS ABOVE CIRCUIT MUF
41      115 JH = MODMUF
42      K = JMODE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

```
38      IF(NHP(JFX).GT.0)RETURN
39      C.....CHECK IF FREQUENCY IS ABOVE CIRCUIT MUF
40      IF(FREQ - ALLMUF(IT) + EPS) 120,115,115
41      C.....INSERT MUF MODE IF FREQUENCY IS ABOVE CIRCUIT MUF
42      115 JH = MODMUF
43      ncall=iflg+1
44      K = JMODE
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

```
53      CALL RELBIL(IFX)
54      RETURN
```

INMOD.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

55 call allMODES(ncall,hop)

56 RETURN

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

59 FV = FVMUF (JH)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

61 ncall=iflg+2

62 FV = FVMUF (JH)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMOD.FOR;1

123 CALL RELBIL(IFX)

124 C.....RESET THE OLD MUF

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMOD.FOR;1

126 call allMODES(ncall,hop)

127 C.....RESET THE OLD MUF

Number of difference sections found: 8

Number of difference records found: 30

INMUF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]INMUF.FOR;1

17 COMMON/ROn/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)

18 A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)

19 B ,FX(3,5),HTR(50),FNSQ(50)

20 COMMON/TIME/ IT,GMT,UTIME(24),GMTR,XLMT(24)

21 K = JMODE

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]INMUF.FOR;1

17 COMMON /ROn /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

18 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

19 2HTR(50), FNSQ(50)

20 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX

21 K = JMODE

Number of difference sections found: 1

Number of difference records found: 4

IONCAP.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONCAP.FOR;1

11 C VERSION 85.04 RELEASE DATE JULY 4, 1985

12 C

13 C N O T E IONCAP VERSION 85.04 IS EQUIVALENT TO IONCAP VERSION

14 C 78.03 BUT HAS BEEN CONVERTED TO THE FORTRAN 77 STANDARD

15 C

16 C VERSION 78.03 ORIGINALLY RELEASED MARCH 1, 1978

17 C

18 C THIS NOTICE INDICATES THAT IONCAP WAS UPDATED OCTOBER 1, 1983

19 C

20 C*****

21 C

22 C QUESTIONS CONCERNING THE IONCAP PROGRAM SHOULD BE DIRECTED TO

IONCAP.FOR (cont'd.)

23 C
24 C JOHN L. LLOYD -OR-
25 C LARRY R. TETERS (303) 497-5410
26 C U. S. DEPARTMENT OF COMMERCE
27 C NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
28 C INSTITUTE FOR TELECOMMUNICATION SCIENCES
29 C 325 BROADWAY
30 C BOULDER, COLORADO 80303
31 C*****
32 C
33 C THE FOLLOWING REPORT DESCRIBES THE OPERATION AND USE OF IONCAP
34 C (A COPY OF THIS REPORT IS PROVIDED WITH THE IONCAP PROGRAM,
35 C ADDITIONAL COPIES MAY BE OBTAINED FROM THE NATIONAL TECHNICAL
36 C INFORMATION SERVICE)
37 C
38 C TETERS, L.R., J.L. LLOYD, G.W. HAYDON AND D.L. LUCAS (1983),
39 C ESTIMATING THE PERFORMANCE OF TELECOMMUNICATIONS SYSTEMS
40 C USING THE IONOSPHERIC TRANSMISSION CHANNEL IONOSPHERIC
41 C COMMUNICATIONS ANALYSIS AND PREDICTION PROGRAM USER'S
42 C MANUAL, NTIA REPORT 83-127, U.S. DEPARTMENT OF COMMERCE,
43 C BOULDER, COLORADO 80303
44 C
45 C
46 C THE FOLLOWING DOCUMENT DESCRIBES THE SIMULATION MODELS USED IN IONCAP
47 C (A COPY OF THIS DOCUMENT IS PROVIDED WITH THE IONCAP PROGRAM)
48 C
49 C LLOYD, J.L., D.L. LUCAS, G.W. HAYDON AND L.R. TETERS,
50 C ESTIMATING THE PERFORMANCE OF TELECOMMUNICATIONS SYSTEMS
51 C USING THE IONOSPHERIC TRANSMISSION CHANNEL TECHNIQUES
52 C FOR ANALYZING IONOSPHERIC EFFECTS UPON HF SYSTEMS,
53 C AN UNPUBLISHED DOCUMENT, U.S. DEPARTMENT OF COMMERCE,
54 C BOULDER, COLORADO 80303
55 C
56 C*****
57 C
58 C THE TECHNIQUES USED IN THIS PROGRAM WERE INITIATED BY
59 C C.C.I.R. REPORT 252-2, NEW DELHI, 1970,
60 C "C.C.I.R. INTERIM METHOD FOR ESTIMATING SKY-WAVE FIELD STRENGTH AND
61 C TRANSMISSION LOSS AT FREQUENCIES BETWEEN THE APPROXIMATE LIMITS OF
62 C 2 AND 30 MHZ" INTERNATIONAL TELECOMMUNICATIONS UNION, GENEVA, 1970.
63 C
64 C ADDITIONAL INFORMATION CONCERNING TECHNIQUES FOR MODELING HF SYSTEMS
65 C THAT DEPEND ON IONOSPHERIC PROPAGATION CAN BE FOUND IN THE FOLLOWING
66 C
67 C NBS REPORT 7619 (1962)
68 C ESSA TECHNICAL REPORT, IER-ITSA 1 (1966)
69 C TECHNICAL REPORT NO. RAD-TR-67-396 (1967)
70 C ESSA TECHNICAL REPORT, ERL 110-ITS-78 (1969)
71 C NRL MEMO REPORT 2226 (1971)
72 C NRL MEMO REPORT 2500 (1972)
73 C
74 C NO ATTEMPT HAS BEEN MADE IN THIS VERSION TO OPTIMIZE RUNNING TIME OR
75 C STORAGE REQUIREMENT.
76 C INPUT IS OF THREE KINDS
77 C 1. CARD IMAGES - THE INPUT IS FORMATTED CARD IMAGES READ
78 C FROM FUNCTION MONITR AND ASSEMBLED IN SUBROUTINE DECODED USING
79 C THE FORTRAN DECODE STATEMENT.

IONCAP.FOR (cont'd.)

80 C 2. LONG TERM DATA TAPE. THIS IS A BINARY TAPE CONTAINING COEFFICIENTS
81 C FOR PREDICTING IONOSPHERIC INDICES. TWO BCD DATA TAPES AND DIRECT-
82 C IONS FOR GENERATING THE BINARY TAPE ARE ADVAIABLE FROM ITS.
83 C 3. ANTENNA GAIN DATA. THE GAIN AS A FUNCTION OF FREQUENCY AND ANGLE
84 C CAN BE READ FROM A FILE. THIS FILE CAN BE CALCULATED FROM THIS
85 C PROGRAM
86 C
87 C*****
88 C
89 C THE IONCAP PROGRAM WAS INITIALLY DEVELOPED ON THE
90 C U.S. DEPARTMENT OF COMMERCE - CDC 6600 COMPUTER
91 C WITH THE KRONOS 2.1 OPERATING SYSTEM AND FORTRAN EXTENDED (FTN)
92 C VERSION 4. THE PROGRAM WAS CODED AS NEAR TO ANS FORTRAN AS WAS
93 C POSSIBLE TO EASE THE ADAPTATION TO OTHER COMPUTER SYSTEMS.
94 C
95 C*****
96 C
97 C FILE DEFINITION OF LOGICAL UNITS USED BY IONCAP
98 C
99 C LOGICAL UNIT MNEMONIC FILE DESCRIPTION
100 C
101 C 5 OR 15 LUI USER DEFINED INPUT (CARD IMAGES)
102 C 6 OR 16 LUO LINE PRINTER OUTPUT
103 C 2 * LU2 IONOSPHERIC LONG TERM DATA BASE
104 C 5 LU5 PRIMARY USER DEFINED INPUT
105 C 6 LU6 PRIMARY LINE PRINTER OUTPUT
106 C 15 LU15 AUXILLARY USER DEFINED INPUT
107 C 16 LU16 AUXILLARY LINE PRINTER OUTPUT
108 C 20 * LU20 COMMON/MUFS/ OUTPUT (METHOD 30)
109 C 25 * LU25 ANTENNA PATTERN OUTPUT
110 C 26 * LU26 OPTIONAL ANTENNA PATTERN INPUT
111 C 35 LU35 INPUT PROCEDURE (INTERNAL FILE)
112 C
113 C * DENOTES BINARY FILE, BCD OTHERWISE
114 C
115 C*****
116 C
117 C THERE ARE THREE BASIC PROGRAM ANALYSIS OPTIONS AVAILABLE TO THE USER
118 C (A) MAXIMUM USABLE FREQUENCIES (MUF)
119 C (B) LOWEST USEFUL HIGH FREQUENCIES (LUF)
120 C (C) SYSTEM PERFORMANCE
121 C
122 C THE PROGRAM ANALYSIS IS CONTROLLED BY A VARIABLE CALLED "METHOD"
123 C WHICH IS INPUT BY THE USER. THE FOLLOWING METHODS ARE AVAILABLE
124 C
125 C METHOD DESCRIPTION OF METHOD
126 C
127 C 1 IONOSPHERIC PARAMETERS
128 C 2 IONOGRAMS
129 C 3 MUF-FOT LINES (NOMOGRAM)
130 C 4 MUF-FOT GRAPH
131 C 5 HPF-MUF-FOT GRAPH
132 C 6 MUF-FOT-ES GRAPH
133 C 7 FOT-MUF TABLE (FULL IONOSPHERE)
134 C 8 MUF-FOT GRAPH
135 C 9 HPF-MUF-FOT GRAPH
136 C 10 MUF-FOT-ANG GRAPH
137 C 11 MUF-FOT-ES GRAPH

IONCAP.FOR (cont'd.)

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138 C 12 MUF BY MAGNETIC INDICES, K. (N O T E NOT YET IMPLEMENTED)
139 C 13 TRANSMITTER ANTENNA PATTERN
140 C 14 RECEIVER ANTENNA PATTERN
141 C 15 BOTH TRANSMITTER AND RECEIVER ANTENNA PATTERNS
142 C 16 SYSTEM PERFORMANCE (S.P.)
143 C 17 CONDENSED SYSTEM PERFORMANCE, RELIABILITY
144 C 18 CONDENSED SYSTEM PERFORMANCE, SERVICE PROBABILITY
145 C 19 PROPAGATION PATH GEOMETRY
146 C 20 COMPLETE SYSTEM PERFORMANCE (C.S.P.)
147 C 21 FORCED LONG PATH MODEL (C.S.P.)
148 C 22 FORCED SHORT PATH MODEL (C.S.P.)
149 C 23 USER SELECTED OUTPUT LINES (SET BY TOPLINES AND BOTLINES)
150 C 24 MUF-REL TABLE
151 C 25 ALL MODES TABLE
152 C 26 MUF-LUF-FOT TABLE (NOMOGRAM)
153 C 27 FOT-LUF GRAPH
154 C 28 MUF-FOT-LUF-GRAPH
155 C 29 MUF-LUF GRAPH
156 C 30 CREATE BINARY FILE OF VARIABLES IN "COMMON/MUFS/"
157 C (ALLOWS THE USER TO SAVE MUFS-LUFS FOR PRINTING BY
158 C A SEPARATE USER WRITTEN PROGRAM)
159 C*****
160 C
161 C THE USER SUPPLIED INPUT TO THE PROGRAM IS CARD IMAGES WHICH CONTAIN
162 C A CARD "NAME IDENTIFIER" USED TO IDENTIFY THE INPUT PARAMETERS
163 C THE FOLLOWING "NAME IDENTIFIERS" ARE IMPLEMENTED
164 C
165 C IDENTIFIER DESCRIPTION OF INPUT PARAMETERS
166 C
167 C METHOD PROGRAM RUN OPTION AND BEGINNING PAGE NUMBER
168 C MONTH YEAR AND A LIST OF UP TO 12 MONTHS
169 C MONTHLOOP YEAR AND MONTHS SPECIFIED IN A LOOP
170 C SUNSPOT LIST OF SUNSPOTS (ALL MONTHS ARE RUN FOR EACH)
171 C CIRCUIT TRANSMITTER-RECEIVER LOCATIONS
172 C SYSTEM POWER, NOISE, MIN.ANGLE, RELIAB, SNR, TIME DELAY
173 C TIME TIME OF DAY LOOP (AND INDICATOR FOR LMT OR UT)
174 C ANTENNA TRANSM OR RECEIVER, ANTENNA TYPE AND PARAMETERS
175 C FREQUENCY FREQUENCIES (THIS SET WILL INSERT FOT)
176 C LABEL ALPHANUMERIC LABEL FOR IDENTIFICATION
177 C INTEGRATE .GE. 0 FOR FAST INTEGRATION FOR E-F2 (NO F1)
178 C EXECUTE EXECUTE PROGRAM WITH PARAMETERS CURRENTLY SET
179 C SAMPLE GEOPHYSICAL SAMPLES (FOR A SPECIFIED AREA)
180 C EFVAR E, F1 AND F2 PARAMETERS (FOR A SPECIFIED AREA)
181 C ESVAR ES PARAMETERS (FOR A SPECIFIED AREA)
182 C EDP TRUE HEIGHTS AND ELECTRON DENSITY(FOR SPEC AREA)
183 C AUXIN READ INPUT CARD IMAGES FROM AN ALTERNATE FILE
184 C AUXOUT WRITE PROGRAM OUTPUT TO AN ALTERNATE FILE
185 C ANTOUT WRITE ANTENNA PATTERNS ON A FILE
186 C OUTGRAPH REQUEST OUTPUT OF SEVERAL METHODS
187 C COMMENT COMMENT CARD IN INPUT STREAM
188 C FREEFORM INPUT IS FREEFORM CARD IMAGES
189 C PROCEDURE DEFINITION OF AN INPUT PROCEDURE
190 C END TERMINATION OF AN INPUT PROCEDURE DEFINITION
191 C NEXT END OF MONTH/SUNSPOT LOOP
192 C QUIT TERMINATION OF PROGRAM EXECUTION
193 C FPROB CRITICAL FREQUENCY MULTIPLIERS
194 C TOPLINES USER SPECIFIED HEADING LINES (FOR METHOD 23)

```

IONCAP.FOR (cont'd.)

```
195 C      BOTLINES          USER SPECIFIED OUTPUT LINES (FOR METHOD 23)
196 C      (USER DEFINED PROCEDURE NAME) REPLACE PROCEDURE NAME WITH ITS DEFN
197 C*****
198 C WEIGHTS AND ABSCISSAE FOR 40 POINT GUASSIAN SET BELOW.
199 C      COMMON / DATR / WT(20), XT(20), NT, NPL, XNPL, TWDIV
200 C      INPUT AND OUTPUT FILE NUMBERS
201 C      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
202 C      A LU26, LU35, LU61
203 C      NUMERICAL MAP COEFICENTS, SEE REDMAP.
204 C      COMMON / ONE / IA(6), IB(6), IKIM(10,6), COFION(2604)
205 C      COMMON / ONE / IA(6), IB(6), IKIM(10,6), ESLCOF(5,55), ESMCOF(7
206 C      1, 61), ESUCOF (5, 55), F2COF (13, 76), FM3COF (9, 49), ERCOF (9, 2
207 C      2 2), XF1COF(10,7), XPMAP(29,16,2), ABMAP(2,3)
208 C      MORE COEFICENTS AND TABLES, SEE REDMAP
209 C      COMMON / TWO / F2D(16,6,6), P(29,16,8), ABP(2,8), DUD(5,12,5),
210 C      A FAM(14,12), SYS(9,16,6), PERR(9,4,6), AB(318)
211 C
212 C      SET PREDEFINED CONSTANTS.
213 C
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONCAP.FOR;1
11 D      INCLUDE 'IONCAP.DOC/LIST'          ! 3 additional PAGEs of INFO
12 C
13 C      WEIGHTS AND ABSCISSAE FOR 40 POINT GUASSIAN SET BELOW:
14 C      COMMON / DATR / WT(20), XT(20), NT, NPL, XNPL, TWDIV
15 C      INPUT AND OUTPUT FILE NUMBERS
16 C      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16,
17 C      1          LU20, LU25, LU26, LU35, LU61
18 C      NUMERICAL MAP COEFICENTS (SEE REDMAP):
19 C      COMMON / ONE / IA(6), IB(6), IKIM(10,6), COFION(2604)
20 C      COMMON / ONE / IA(6), IB(6), IKIM(10,6), ESLCOF(5,55),
21 C      1          ESMCOF(7,61), ESUCOF(5,55), F2COF(13,76),
22 C      2          FM3COF(9,49), ERCOF(9,22), XF1COF(10,7),
23 C      3          XPMAP(29,16,2), ABMAP(2,3)
24 C      MORE COEFICENTS AND TABLES (SEE REDMAP):
25 C      COMMON / TWO / F2D(16,6,6), P(29,16,8), ABP(2,8), DUD(5,12,5),
26 C      1          FAM(14,12), SYS(9,16,6), PERR(9,4,6), AB(318)
27 C
28 C      SET PREDEFINED CONSTANTS:
29 C
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONCAP.FOR;1
216 DATA IIA / 1,276,703,978,1966,2407/
217 DATA IIB / 5, 7, 5, 13, 9, 9/
218 C
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONCAP.FOR;1
32 DATA IIA / 1,276,703,978,1966,2407 /
33 DATA IIB / 5, 7, 5, 13, 9, 9 /
34 C
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONCAP.FOR;1
229 C.....REWIND INPUT LOGICAL UNITS BEFORE EXECUTION
230 REWIND LU2
```

IONCAP.FOR (cont'd.)

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONCAP.FOR;1
  45 C....REWIND INPUT LOGICAL UNITS BEFORE EXECUTION:
  46 REWIND LU2
```


```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONCAP.FOR;1
  235 END
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONCAP.FOR;1
  51 CLOSE(UNIT=LU2)
  52 CLOSE(UNIT=LU26)
  53 END
```

Number of difference sections found: 4
Number of difference records found: 207

IONPLT.FOR

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONPLT.FOR;1
  11 COMMON /TIME /IT, GMT, UTIME (24)
  12 COMMON / MFAC /F2M3(5),HPF2(5),ZENANG(5),ZENMAX(5),IEDP,FSECV(3)
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONPLT.FOR;1
  11 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
  12 COMMON / MFAC /F2M3(5),HPF2(5),ZENANG(5),ZENMAX(5),IEDP,FSECV(3)
```


```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONPLT.FOR;1
  16 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTD, GLD,
  17 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
  18 2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
  19 COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONPLT.FOR;1
  16 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
  17 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
  18 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
  19 COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```


```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONPLT.FOR;1
  22 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
  23 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
  24 2, KFX, AFAC (30, 3), HNOR (3)
  25 COMMON / SSP / SUN(2,12), MONTH
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONPLT.FOR;1
  22 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
  23 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
  24 2HTR(50), FNSQ(50)
  25 COMMON / SSP / SUN(2,12), MONTH
```


```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONPLT.FOR;1
  147 500 FORMAT(' ',14X,10(I2,8X))
  148 501 FORMAT(' ',14X,9(I2,8X),I2,7X,'FVERT',3X,'HTRUE',3X,'HPRIM')
  149 502 FORMAT(' ',5X,20('+-'))
  150 504 FORMAT(' ',1X,A3,1X,A1,100A1,A1)
```

IONPLT.FOR (cont'd.)

```
151      505 FORMAT(' ',1X,A3,1X,A1,100A1,A1,I3,3F8.2)
152      506 FORMAT(' ',1X,A3,1X,A1,1X,A3,F5.2,1X,F5.1,1X,F5.1,1X,78A1,A1,I3,
153          1 3F8.2)
154      520 FORMAT('1')
155      522 FORMAT(' ',20X,'VIRTUAL HEIGHT - REFLECTION HEIGHT VS. SOUNDING',
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONPLT.FOR;1

```
147      500 FORMAT(' ',12X,10(I2,8X))
148      501 FORMAT(' ',12X,9(I2,8X),I2,6X,'FVERT',3X,'HTRUE',3X,'HPRIM')
149      502 FORMAT(' ',3X,20('+---'))
150      504 FORMAT(' ',A3,A1,100A1,A1)
151      505 FORMAT(' ',A3,A1,100A1,A1,I3,F7.2,2F8.2)
152      506 FORMAT(' ',A3,A1,1X,A3,F5.2,1X,F5.1,1X,F5.1,1X,78A1,A1,I3,
153          1 F7.2,2F8.2)
154      520 FORMAT(1H1)
155      522 FORMAT(' ',20X,'VIRTUAL HEIGHT - REFLECTION HEIGHT VS. SOUNDING',
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONPLT.FOR;1

```
161      528 FORMAT(' ',1X,A3,1X,A1,1X,A3,3(F5.2,1X),F5.1,1X,72A1,
162          A A1,I3,3F8.2)
163          END
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONPLT.FOR;1

```
161      528 FORMAT(' ',A3,A1,1X,A3,3(F5.2,1X),F5.1,1X,72A1,
162          A A1,I3,F7.2,2F8.2)
163          END
```

Number of difference sections found: 5

Number of difference records found: 17

IONSET.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]IONSET.FOR;1

```
9          COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
10          1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
11          2, KFX
12          IF (KM - 1)105, 105, 110
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]IONSET.FOR;1

```
9          COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
10          1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
11          2HTR(50), FNSQ(50)
12          IF (KM - 1)105, 105, 110
```

Number of difference sections found: 1

Number of difference records found: 3

LECDEN.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LECDEN.FOR;1

```
13          C NUMNAM, NUPROC, MAXMET
14          COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GLD,
15          1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
16          2ATD, TLONG, TLONGD
17          COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
18          1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
19          2 , KFX, AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
```

LECDEN.FOR (cont'd.)

```
20 C.....RETURN IF EXTERNAL ELECTRON DENSITY PROFILE IS USED
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LECDEN.FOR;1
13 C NUMNAM, NUPROC, MAXMET, mspec, m100
14 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
15 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
16 2 TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
17 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
18 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
19 2HTR(50), FNSQ(50)
20 C.....RETURN IF EXTERNAL ELECTRON DENSITY PROFILE IS USED
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LECDEN.FOR;1
64 HB1 = HI(2,K) - YI(2,K)
65 IF(HB2 - HB1) 110, 110, 126
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LECDEN.FOR;1
64 HB1 = HI(2,K) - YI(2,K)+.00001
65 IF(HB2 - HB1) 110, 110, 126
*****
Number of difference sections found: 2
Number of difference records found: 8
```

LISTIN.FOR

```
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LISTIN.FOR;1
7 C NUMNAM, NUPROC, MAXMET
8 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
9 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LISTIN.FOR;1
7 C NUMNAM, NUPROC, MAXMET, mspec, m100
8 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
9 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LISTIN.FOR;1
119 1500 FORMAT('1','IONOSPHERIC COMMUNICATIONS ANALYSIS AND PREDICTION ',
120 A 'PROGRAM - IONCAP VERSION ',F5.2,/)
121 1502 FORMAT(' ',8(9X,I1),/, ' ',8('1234567890'),/)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LISTIN.FOR;1
119 1500 FORMAT(1H1,' IONOSPHERIC COMMUNICATIONS ANALYSIS AND PREDICTI',
120 A 'ON PROGRAM - IONCAP VERSION ',F5.2,/)
121 1502 FORMAT(' ',8(9X,I1),/, ' ',8('1234567890'),/)
*****
Number of difference sections found: 2
Number of difference records found: 4
```

LNGOUT.FOR

```
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGOUT.FOR;1
3 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
4 A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD
5 B ,BRTR,FLUX,SSN,ATMNO
6 COMMON/FRQ/FREL(29),FREQ
7 COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(45
```

LNGOUT.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGOUT.FOR;1

```
3      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
4      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
5      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
6      COMMON / FRQ / FREL(29), FREQ, JMODE
7      COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(45
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGOUT.FOR;1

```
10     COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
11     COMMON/REFLX/DELFX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
12     A (45,3)
13     COMMON/TIME/IT,GMT,UTIME(24)
14     COMMON /ZON/ ABPS(7),CREL(7),EFF(7),FLDST(7),GRLOS(7),HN(7),HP(7)
15     A ,PROB(7),RELY(7),RGAIN(7),SIGPOW(7),SN(7),SPRO(7),TGAIN(7),TIMED
16     B (7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7)
17     CHARACTER NNAME(12)*10
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGOUT.FOR;1

```
10     COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
11     COMMON/REFLX/DELFX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
12     A (45,3)
13     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
14     COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
15     1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
16     2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
17     3 OBF(7),NMODE(7),TLLOW(7),TLHGH(7)
18     CHARACTER NNAME(12)*10
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGOUT.FOR;1

```
21     XLMT = GMT
22     DEND = AMIN1(GCDKM,4000.)
23     CNGDAY = CNGTIM( XLMT, TLONG*R2D, 1)
24     DO 125 IA=1,NANG
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGOUT.FOR;1

```
22     XTIM = GMT
23     DEND = AMIN1(GCDKM,4000.)
24     CNGDAY = CNGTIM( XTIM, TLONG*R2D, 1)
25     DO 125 IA=1,NANG
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGOUT.FOR;1

```
51     502 FORMAT('1',1X,'FREQ;',F5.2,' UT; ',F5.2,' LMT;',F5.2,' DIST;',
52     A F7.1,' KM ',A3,' SSN; ',F5.1)
53     506 FORMAT(' ',1X,F4.1,2X,F6.1,2X,F4.1,1X,F6.1,1X,F6.1,2X,F6.1,1X,
54     A F6.1,1X,F6.1,2X,F5.1,2X,F5.1,2X,F4.1,2X,F10.4,2X,F10.4)
55     510 FORMAT('0','TANG ',F4.1,' TMODE ',A2,' TPROB ',F6.2,
56     A ' RPROB ',F6.2,' RMODE ',A2,' RANG ',F4.1)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGOUT.FOR;1

```
52     502 FORMAT(1H1,1X,'FREQ;',F5.2,' UT; ',F5.2,' LMT;',F5.2,' DI',
53     A 'ST;',F7.1,' KM ',A3,' SSN; ',F5.1)
54     506 FORMAT(' ',1X,F4.1,2X,F6.1,2X,F4.1,1X,F6.1,1X,F6.1,2X,F6.1,1X,
55     A F6.1,1X,F6.1,2X,F5.1,2X,F5.1,2X,F4.1,2X,F10.4,2X,F10.4)
56     510 FORMAT(/,/, 'TANG ',F4.1,' TMODE ',A2,' TPROB ',F6.2,
57     A ' RPROB ',F6.2,' RMODE ',A2,' RANG ',F4.1)
```

LNGOUT.FOR (cont'd.)

Number of difference sections found: 4
Number of difference records found: 20

LNGPAT.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGPAT.FOR;1

5 COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK
6 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGPAT.FOR;1

5 COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SxGU,SxGL,KJ,JK
6 COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGPAT.FOR;1

11 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
12 A ,PWR,ARAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD,
13 A BRTD,FLUX,SSN,ATMNO
14 COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
15 COMMON/FRQ/FREL(29),FREQ
16 COMMON / RON / CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5)
17 1 , HI(3,5), HPRIM(30,3), HTRUE(30,3), FVERT(30,3), KM, KFX,
18 2 AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
19 COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(45

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGPAT.FOR;1

11 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
12 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
13 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
14 COMMON / FRQ / FREL(29), FREQ, JMODE
15 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
16 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
17 2HTR(50), FNSQ(50)
18 COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(45

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LNGPAT.FOR;1

23 B , ISKP(3), IMODE(45,3), AFFLX(45,3), DELPEN(3,3)
24 COMMON/SIGD/DSL, ASM, DSU, AGLAT, DSLF, ASMF, DSUF, ACAV, FEAV, AFE, BFE, HNU
25 A , HTLOSS, XNUZ, XVE
26 COMMON/TON/ADJ, ADS, ATMO, GNOS, GOT, PWRDB, ZCNSE, REL, SL, SLS, SPR, SU, SUS
27 A , TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
28 COMMON /ZON/ ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7), HN(7), HP(7),
29 A PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7), SPRO(7), TGAIN(7), TIMED
30 B (7), TLOSS(7), B(7), FSLOS(7), ADV(7), OBF(7), NMODE(7)
31 C , NPROB, NREL, TLLOW(7), TLHGH(7)
32 C.....LTGM .GE. 1 AND LRGM .GE. 1 SINCE OVER-THE-MUF ADDED

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LNGPAT.FOR;1

22 B , ISKP(3), IMODE(45,3), AFFLX(45,3), DELPEN(3,5)
23 COMMON/SIGD/DSL, ASM, DSU, AGLAT, DSLF, ASMF, DSUF, ACAV, FEAV, AFE, BFE, HNU
24 A , HTLOSS, XNUZ, XVE
25 COMMON/TON/ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS, SPR, SU, SUS
26 A , XNOISE, 2NOISE, NF
27 COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
28 1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
29 2 SPRO(7), TGAIN(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
30 3 OBF(7), NMODE(7), TLLOW(7), TLHGH(7)

LNGPAT.FOR (cont'd.)

31 C.....LTGM .GE. 1 AND LRGM .GE. 1 SINCE OVER-THE-MUF ADDED

Number of difference sections found: 3
Number of difference records found: 18

LUFFY.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

1 SUBROUTINE LUFFY
2 C
3 C SHORT PATH SYSTEM PERFORMANCE
4 C

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1

1 SUBROUTINE LUFFY(IPFLAG)
2 C
3 C LONG AND SHORT PATH SYSTEM PERFORMANCE AND LUF.
4 C
5 C IPFG FUNCTION
6 C ----
7 C 100 SHORT PATH SYSTEM PERFORMANCE
8 C 200 LONG PATH SYSTEM PERFORMANCE
9 C 300 SHORT PATH LUF
10 C 400 LONG PATH LUF
11 C

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

10 C NUMNAM, NUPROC, MAXMET
11 COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14).
12 A GRPTYP, JOUT, LINBYP, LINES, LINMAX, LINTYP, LPAGES, NLINE
13 COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
14 COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13).
15 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13).
16 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1

17 C NUMNAM, NUPROC, MAXMET, mspec, ml00
18 COMMON / OUTLAB / LABEL(11), LAYTYP(5), IEAST, INORTH, ISOUTH,
19 A IWEST, LABLI, LABLJ, LABLK
20 COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14).
21 A GRPTYP, JOUT, LINBYP, LINES, LINMAX, LINTYP, LPAGES, NLINE
22 COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
23 COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13).
24 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13).
25 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

31 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
32 2ATD, TLONG, TLONGD
33 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
34 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
35 2, KFX, AFAC (30, 3), HNOR (3)
36 COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
37 1 ANT, RETA, RSIG, REPS, RND, RNL, RNH, REX(4), TEFF, REFF, KASANT
38 COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
39 1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),

LUFFY.FOR (cont'd.)

```
40      2 SPRO (7), TGAIn (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
41      C (7), OBF (7), NMODE (7), NPROB, NREL, TLLOW (7), TLHGH (7)
42      COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, RCNSE, REL, SL, SLS
43      1, SPR, SU, SUS, TIMER, XADJN, XEFF, XNOISE, XTLOS, ZNOISE, NF
44      COMMON / FRQ / FREL (29), FREQ, JMODE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1

```
40      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
41      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
42      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3,5), YI (3,5),
43      1HI (3,5), HPRIM (30,5), HTRUE (30,5), FVERT (30,5), KM, KFX, AFAC (30,5),
44      2HTR (50), FNSQ (50)
45      COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
46      1 ANT, RETA, RSIG, REPS, RND, RNL, RNH, REX (4), TEFF, REFF, KASANT
47      COMMON /ION /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
48      1, SPR, SU, SUS, XNOISE, ZNOISE, NF
49      COMMON / FRQ / FREL (29), FREQ, JMODE
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

```
53      COMMON /TIME /IT, GMT, UTIME (24)
54      C.....TEMPORARY STORAGE
55      DIMENSION XANG (3), XCPB (3), XDBL (3), XDBU (3), XDLY (3), XPMP (3),
56      A XREL (3), XSN (3), XSPB (3), XVHI (3), LMOD (3), LNDB (3), LNHP (3),
57      B LNOIS (3), XSNP (3), XREFF (3)
58      DIMENSION XDBLL (3), XDBLU (3), XTGA (3), XRG (3), XFSL (3), XABS (3),
59      A XOBF (3), XADL (3), XGRD (3)
60      CHARACTER ISTAR*2
61      CHARACTER MODE*2, MODER*2, MODVHF*2
62      CHARACTER IMON*3, IRCVR*10, ITRAN*10, IRLAT*1, IRLONG*1, ITLAT*1,
63      A ITLONG*1, NYEAR*5
64      DATA ISTAR/' N'/
65      C.....SET FLAG IN INDICATE SHORT PATH MODEL
66      JLONG = -1
67      C.....REDUCE ANGLE SCAN FOR THIS DISTANCE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1

```
58      COMMON / ION / IANT (3,2), NTR (2), IEA, IFQB, IFQE, IGRAPH, IHRE,
59      A IHRO, IHRS, JO, LUPF, METHOD, MONPR, NDAY, NES, NOISE, NPAT,
60      B NPSL, NRSP, NUMO
61      COMMON / allMODE /ABPS (20), CREL (20), FLDST (20), HN (20), HP (20),
62      1PROB (20), RELY (20), RGAIN (20), SIGPOW (20), SN (20),
63      2SPRO (20), TGAIn (20), TIMED (20), TLOSS (20), B (20), FSLOS (20),
64      CNMODE (20), TLLOW (20), TLHGH (20), EFF (20), NREL, NMMD
65      COMMON / TIME / IT, GMT, UTIME (24), GMTR, XLMT (24), ITIM, JTX
66      common/indicez/ispot, isez, ifqn, iour, inmd (11,24,4,2)
67      C.....TEMPORARY STORAGE
68      DIMENSION FREA (13)
69      CHARACTER ISTAR*2
70      CHARACTER MODE*2, MODER*2, MODVHF*2, LAYTYP*2
71      CHARACTER IMON*3, IRCVR*10, ITRAN*10, IRLAT*1, IRLONG*1, ITLAT*1,
72      A ITLONG*1, NYEAR*5
73      CHARACTER LABEL*5, IEAST*1, INORTH*1, ISOUTH*1, IWEST*1, LABLI*5,
74      A LABLJ*5, LABLK*5
75      IPFG=IPFLAG
76      IF (IPFG.LT.300) THEN
77      IF (IPFG.EQ.100) THEN
```

LUFFY.FOR (cont'd.)

```
78 C.....SET FLAG TO INDICATE SHORT PATH MODEL
79     JLONG = -1
80     ISTAR=' N'
81     ELSE
82 C.....SET FLAG TO INDICATE LONG PATH MODEL
83     JLONG = 1
84     ISTAR='* '
85     ENDIF
86
87     ELSE
88     PLUF = LUPF
89 C.....REQUIRED RELIABILITY
90     PLUF = .01 * PLUF
91     ENDIF
92 C.....REDUCE ANGLE SCAN FOR THIS DISTANCE
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1
71     K = JMODE
72 C.....ELECTRON DENSITY PROFILE
73     CALL LECDEN(K)
74 C.....IONOGRAM
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1
96     IF((IPFG.EQ.100).OR.(IPFG.EQ.300))THEN
97 C.....SELECT SHORT PATH AREA
98     K = JMODE
99     ELSE
100 C.....SELECT LONG PATH TRANSMITTER AREA
101     K=1
102     ENDIF
103 C.....ELECTRON DENSITY PROFILE
104 84     CALL LECDEN(K)
105 C.....IONOGRAM
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1
80 C.....SET ABSORPTION LOSS PARAMETERS, ADJUST SIGNAL DISTRIBUTION TABLES
81     CALL SIGDIS
82 C GET NOISE VALUE AT 1 MHZ FOR RCVR SITE
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1
111     IF((IPFG.EQ.100).OR.(K.GT.1))GO TO 87
112 C.....CAN RUN FOR SHORT PATHS ALSO
113 C.....SO SET ALL SAMPLE AREAS
114     CALL SETLNG
115 C.....FIND LONG PATH RECEIVER INDEX
116     IF(KFX.EQ.2)THEN
117     K=2
118     ELSE IF(KFX.GT.2)THEN
119     K=3
120     ELSE
121     GO TO 87
122     ENDIF
123     GO TO 84
124 C.....SET ABSORPTION LOSS PARAMETERS, ADJUST SIGNAL DISTRIBUTION TABLES
125 87     CALL SIGDIS
126 C GET NOISE VALUE AT 1 MHZ FOR RCVR SITE
```

LUFFY.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

```

85      DO 265 IF=1,13
86      C.....START OF PRESET OF COMMON/ZON/
87      IFX = IF
88      ANGLE (IF) = -1.0
89      ANGLER(IF) = -1.0
90      CPROB (IF) = 0.0
91      DBLOS (IF) = 1000.
92      DBLOSL(IF) = 10.
93      DBLOSU(IF) = 10.
94      DBU   (IF) = -1000.
95      DELAY (IF) = -1.
96      PROBMP (IF) = 0.0
97      RELIAB(IF) = 0.0
98      SNDB  (IF) = -1000.
99      SPROB (IF) = 0.0
100     VHIGH (IF) = -1.
101     MODE(IF) = ISTAR
102     MODER(IF) = ISTAR
103     NDBW  (IF) = -1000.
104     NHP   (IF) = -1.
105     NYNOIS (IF) = 1000.
106     VDBU(IF) = -1000.
107     VLLOW(IF) = 10.
108     VLUP(IF) = 10.
109     MODVHF(IF) = ISTAR
110     SNPR(IF) = 1000.
111     C.....END OF PRESET OF COMMON/ZON/
112     IF (IF -13) 116,270,270
113     C.....FREQUENCY COMPLEMENT MAY NOT BE FULL
114     116 IF (FREL(IF) ) 265,265,120
115     120 FREQ = FREL(IF)
116     K = JMODE
117     C.....RAY SET TABLE
118     CALL FINDF(K)
119     C.....NOISE DISTRIBUTION
120     CALL GENOIS
121     IF( DMAXKM(K) ) 122,122,123
122     C.....ONLY ONE OVER THE MUF MODE
123     122 IHSRT = NHOPMF(MODMUF)
124     IHSTP = IHSRT
125     GO TO 124
126     C.....UP TO THREE HOPS
127     123 IHSRT = GCDKM/DMAXKM(K) + 1.
128     IHSTP = GCDKM/DSKPKM(K)
129     IHSTP = MAX0(IHSTP,IHSRT)
130     IHSTP =MIN0(IHSTP,IHSRT+2)
131     124 IXHP = 0
132     C.....HOP LOOP
133     DO 262 IHOP = IHSRT, IHSTP
134     IXHP = IXHP + 1
135     HOP = IHOP
136     C.....HOP DISTANCE
137     GHOP = GCD/HOP
138     C.....FIND UP TO SIX MODES
139     CALL REGMOD
```

LUFFY.FOR (cont'd.)

```
140 C.....FIND THE MOST RELIABLE
141     CALL RELBIL(IFX)
142 C.....BEGINNING OF SAVING THE MOST RELIABLE MODE
143     XANG (IXHP) = ANGLE (IF)
144     XCPB (IXHP) = CPROB (IF)
145     XDBL (IXHP) = DBLOS (IF)
146     XDBU (IXHP) = DBU (IF)
147     XDELY (IXHP) = DELAY (IF)
148     XPMP (IXHP) = PROBMP (IF)
149     XREL (IXHP) = RELIAB (IF)
150     XSN (IXHP) = SNDB (IF)
151     XSPB (IXHP) = SPROB (IF)
152     XVHI (IXHP) = VHIGH (IF)
153     LMOD (IXHP) = NMODE (NREL)
154     LNDB (IXHP) = NDBW (IF)
155     LNHP (IXHP) = NHP (IF)
156     LNOIS (IXHP) = NYNOIS (IF)
157     XSNP (IXHP) = SNPR (IF)
158     XREFF (IXHP) = REFF
159     IXHT = IXHP
160     XDBLL (IXHT) = DBLOSL (IF)
161     XDBLU (IXHT) = DBLOSU (IF)
162     XTGA (IXHT) = TGAIN (NREL)
163     XRGAIN (IXHT) = RGAIN (NREL)
164     XFSL (IXHT) = FSLOS (NREL)
165     XABS (IXHT) = ABPS (NREL)
166     XOBF (IXHT) = OBF (NREL)
167     XADL (IXHT) = ADV (NREL)
168     XGRD (IXHT) = GRLOS (NREL)
169 C.....END OF SAVING THE MOST RELIABLE MODE
170     262 CONTINUE
171 C.....END OF THE HOP LOOP
172     IXHP = 0
173 C.....BEGINNING OF SAVING THE MOST RELIABLE MODE FOR EACH HOP
174     DO 264 IHOP = IHSRT, IHSTP
175     IXHP = IXHP + 1
176     TLOSS (IXHP) = XDBL (IXHP)
177     TIMED (IXHP) = XDELY (IXHP)
178     B (IXHP) = XANG (IXHP)
179     HP (IXHP) = XVHI (IXHP)
180     FLDST (IXHP) = XDBU (IXHP)
181     SIGPOW (IXHP) = LNDB (IXHP)
182     SN (IXHP) = XSN (IXHP)
183     PROB (IXHP) = XCPB (IXHP)
184     CREL (IXHP) = XSNP (IXHP)
185     RELY (IXHP) = XREL (IXHP)
186     SPRO (IXHP) = XSPB (IXHP)
187     NMODE (IXHP) = LMOD (IXHP)
188     HN (IXHP) = LNHP (IXHP)
189     EFF (IXHP) = XREFF (IXHP)
190     TLOW (IXHP) = XDBLL (IXHP)
191     TLHGH (IXHP) = XDBLU (IXHP)
192     TGAIN (IXHP) = XTGA (IXHP)
193     RGAIN (IXHP) = XRGAIN (IXHP)
194     FSLOS (IXHP) = XFSL (IXHP)
195     ABPS (IXHP) = XABS (IXHP)
196     OBF (IXHP) = XOBF (IXHP)
197     ADV (IXHP) = XADL (IXHP)
```

LUFFY.FOR (cont'd.)

```
198      GRLOS(IXHP) = XGRD (IXHP)
199      264 CONTINUE
200      C.....ENDING OF SAVING THE MOST RELIABLE MODE FOR EACH HOP
201      C
202      C
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1
129      IF(IPFG.GT.200)THEN
130      C.....FREQUENCY COMPLEMENT
131      CALL FRQCOM(FREA,0)
132      ENDIF
133      NHP (13) = -1
134      DO 265 IF=1,12
135      IPFG=IPFLAG
136      IFX = IF
137      IF(IPFG.LT.300)THEN
138      C.....PRESET IN COMMON/SON/
139      NHP (IF) = -1
140      SPROB(IF)=.000
141      PROBMP(IF)=.000
142      C.....IS FREQUENCY COMPLEMENT FULL
143      116 IF (FREL(IF) ) 265,265,120
144      120 FREQ = FREL(IF)
145      ELSE
146      FREQ=FREA(IF)
147      RELIAB(IF)=0.0
148      ENDIF
149      C-----
150      if(mspec.eq.125.and.if.gt.11)THEN
151      go to 265
152      ELSE
153      iflag=0
154      ifqn=if
155      call allMODES(iflag,freq)
156      endif
157      IF((IPFG.EQ.100).OR.(IPFG.EQ.300))THEN
158      K = JMODE
159      C.....RAY SET TABLE
160      CALL FINDF(K)
161      C.....NOISE DISTRIBUTION
162      CALL GENOIS
163      IF( DMAXKM(K) ) 122,122,123
164      122 IF(IPFG.EQ.300)then
165      go to 265
166      else
167      C.....ONLY ONE OVER THE MUF MODE
168      IHSRT = NHOPMF(MODMUF)
169      IHSTP = IHSRT
170      endif
171      GO TO 124
172      C.....UP TO THREE HOPS
173      123 IHSRT = GCDKM/DMAXKM(K) + 1.
174      IHSTP = GCDKM/DSKPKM(K)
175      IHSTP = MAX0(IHSTP,IHSRT)
176      IHSTP =MIN0(IHSTP,IHSRT+2)
177      124 IXHP = 0
```

LUFFY.FOR (cont'd.)

```
178 C.....HOP LOOP
179     DO 262 IHOP = IHSRT, IHSTP
180     IXHP = IXHP + 1
181     HOP = IHOP
182 C.....HOP DISTANCE
183     GHOP = GCD/HOP
184 C.....FIND UP TO SIX MODES
185     CALL REGMOD
186 C.....SAVE ALL MODES AVAILABLE
187     CALL ALLMODES(IPFG,HOP)
188     262 CONTINUE
189 C.....END OF THE HOP LOOP
190 C
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]LUFFY.FOR;1

```
205     CALL INMOD(IFX)
206 C.....UP TO 2 ES MODES
207     CALL ESMOD
208 C.....ONE ES - F MODES
209     CALL ESREG
210 C.....COMBINED RELIABILITY
211     CALL RELBIL(IFX)
212 C.....CHECK TO SEE IF SERVICE PROBABILITIES ARE TO BE OUTPUT
213     IF( LINBOT(14) ) 285,285,280
214 C.....CALCULATE SERVICE PROBABILITIES
215     280 CALL SERPRB(IFX)
216     285 CONTINUE
217 C.....CALCULATE MULTIPATH
218     CALL MPATH(IFX)
219 C.....ALL MODE OUTPUT
220     CALL OUTALL(IF)
221 C.....TEMP FOR OVER MUF VHF
222     CALL CALVHF(IF)
223     265 CONTINUE
224 C.....END OF FREQUENCY LOOP
225     270 CONTINUE
226     RETURN
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]LUFFY.FOR;1

```
193     268 IF(NMMOD.LT.1)THEN
194 C.....FIND AT LEAST ONE MODE
195     CALL INMOD(IFX,ipfg)
196     ENDIF
197 C.....UP TO 2 ES MODES
198     CALL ESMOD
199 C.....ONE ES - F MODES
200     CALL ESREG
201     CALL ALLMODES(2,999.)
202     ELSE
203 C.....NOISE DISTRIBUTION
204     CALL GENOIS
205 C.....AREA COVERAGE, TRANSMITTER END
206     CALL FINDF(1)
207 C.....AREA COVERAGE, RECEIVER END
208     CALL FINDF(3)
209 C.....GAIN MINUS LOSS
210     CALL GMLOSS
```

LUFFY.FOR (cont'd.)

```
211 C.....SELECT OPTIMUM AT TRANSMITTER END
212     CALL SELTMT
213 C.....SELECT OPTIMUM AT RECEIVER END
214     CALL SELRCR
215 C.....DO MODE CALCULATIONS
216     CALL LNGPAT
217     CALL ALLMODES(1,999.)
218     ENDIF
219     IF(MSPEC.EQ.125)GO TO 265
220 C.....COMBINED RELIABILITY
221     call relbil(ifx)
222     IF(IPFG.LT.300)THEN
223 C.....CHECK TO SEE IF SERVICE PROBABILITIES ARE TO BE OUTPUT
224     IF( LINBOT(14) ) 285,285,280
225 C.....CALCULATE SERVICE PROBABILITIES
226     280 CALL SERPRB(IFX)
227     285 CONTINUE
228     IF(IPFG.EQ.100)THEN
229 C.....CALCULATE MULTIPATH
230     CALL MPATH(IFX)
231     ELSE
232 C.....SET RECEIVER END
233     IS = NMODE(2)
234     MODER(IF) = LAYTYP(IS)
235     ANGLER(IF) = B(2)
236     ENDIF
237 C.....normal ALL MODE OUTPUT
238     CALL OUTALL(IF)
239 C.....TEMP FOR OVER MUF VHF
240     CALL CALVHF(IF)
241     ELSE
242 C.....TEST RELIABILITY
243     140 IF(RELIAB(IF).GE.PLUF)GO TO 165
244     ENDIF
245     265 CONTINUE
246 C.....END OF FREQUENCY LOOP
247     if(mspec.eq.125.or.method.eq.25)return
248     270 CONTINUE
249     IF(IPFG.LT.300)RETURN
250 C NO LUF FOUND. ,FIND HIGHEST RELIABILITY AND QUIT.
251     150 CONTINUE
252     IG =1
253     REL = RELIAB(1)
254     DO 160 IF = 2,12
255     IF(RELIAB(IF) - REL) 160, 160, 155
256     155 IG = IF
257     160 CONTINUE
258     XLUF(IT) = -FREA(IG)
259     FREA(13) = FREA(IG)
260     RETURN
261     165 CONTINUE
262     IF( IF -1) 170,170,175
263 C FIRST FREQUENCY IS GOOD.
264     170 XLUF(IT) = FREQ
265     FREA(13) = FREQ
266     RETURN
```

LUFFY.FOR (cont'd.)

```
267 C.....NO ITERATION, SELECT THE FREQUENCY COMPLEMENT FIRST
268     175 CONTINUE
269     190 FLOW = FREA(IF-1)
270         FHIGH= FREA(IF)
271         RLOW = RELIAB(IF-1)
272         RHIGH= RELIAB(IF)
273         IF = 13
274 C.....USE LINEAR INTERPOLATION
275         XLUF(IT) = FLOW + (FHIGH - FLOW) * (PLUF - RLOW) / (RHIGH - RLOW)
276         FREA(13) = XLUF(IT)
277         RETURN
```

Number of difference sections found: 8
Number of difference records found: 290

MAGFIN.FOR

Number of difference sections found: 0
Number of difference records found: 0

MAGVAR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]MAGVAR.FOR;1

```
15     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
16     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
17     2, KFX
18     COMMON /GEOG /GY (5), RAT (5), GMDIP (5)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]MAGVAR.FOR;1

```
15     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
16     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
17     2HTR(50), FNSQ(50)
18     COMMON /GEOG /GY (5), RAT (5), GMDIP (5)
```

Number of difference sections found: 1
Number of difference records found: 3

MONITR.DLF

Number of difference sections found: 0
Number of difference records found: 0

MPATH.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]MPATH.FOR;1

```
7     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
8     2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
9     COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]MPATH.FOR;1

```
7     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
8     2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
9     COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV
```

MPATH.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]MPATH.FOR;1

```
12      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
13      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
14      C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)
15      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
16      1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
17      2 SPRO (7), TGAIN (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
18      C (7), OBF(7), NMODE(7), NPROB, NREL
19      IF(DMP) 95,95,100
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]MPATH.FOR;1

```
12      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
13      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
14      C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)
15      COMMON / allMODE / ABPS(20), CREL(20), FLDST(20), HN(20), HP(20),
16      1PROB(20), RELY(20), RGAIN(20), SIGPOW(20), SN(20),
17      2SPRO(20), TGAIN(20), TIMEFD(20), TLOSS(20), B(20), FSLOS(20),
18      CNMODE(20), TLLOW(20), TLHGH(20), EFF(20), NREL, NMMOD
19      IF(DMP) 95,95,100
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]MPATH.FOR;1

```
25      DO 135 IM = 1,6
26      IF( IM - NREL) 105,135,105
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]MPATH.FOR;1

```
25      DO 135 IM = 1,NMMOD
26      IF( IM - NREL) 105,135,105
```

Number of difference sections found: 3
Number of difference records found: 10

NOISY.FOR

Number of difference sections found: 0
Number of difference records found: 0

NONMUF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]NONMUF.FOR;1

```
9      COMMON/RON/CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5), HI(3,5)
10     A, HPRIM(30,3), HTRUE(30,3), FVERT(30,3), KM, KFX, AFAC(30,3), HNOR(3)
11     COMMON/DON/ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD, GCDKM, PMP
12     A , PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TLATD, TLONG, TLONGD
13     B , BTRD, FLUX, SSN, ATMNO
14     COMMON/TIME/IT, GMT, UTIME(24)
15     COMMON / MFAC / F2M3(5), HPF2(5), ZENANG(5), ZENMAX(5)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]NONMUF.FOR;1

```
9      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
10     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
11     2HTR(50), FNSQ(50)
12     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
13     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
14     2 TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
15     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
16     COMMON / MFAC / F2M3(5), HPF2(5), ZENANG(5), ZENMAX(5)
```

NONMUF.FOR (cont'd.)

Number of difference sections found: 1
Number of difference records found: 7

OUTALL.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```
9      COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
10     COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,
11     1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
12     2 TLAT, TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, ATMNO, D90R, D50R,
13     3 D10R, D90S, D50S, D10S
14     COMMON / FRQ / FREL(29), FREQ
15     COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1

```
9      COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK
10     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
11     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
12     2 TLATD, TLONG, TLONGD, BTRD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
13     COMMON / FRQ / FREL(29), FREQ, JMODE
14     COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5), ART
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```
23     COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
24     COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1

```
22     COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
23     COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```
30     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
31     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
32     2, KFX, AFAC (30, 3), HNOR (3)
33     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1

```
29     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
30     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
31     2HTR(50), FNSQ(50)
32     COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```
36     A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
37     B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
38     C SNRLW(13), SNRUP(13), SPROB(13), VHGH(13)
39     COMMON /TIME /IT, GMT, UTIME (24)
40     COMMON / TON / ADJ, ADS, ATMO, GNOS, GOT, PWRDB, ZCNSE, REL, SL,
41     2 SLS, SPR, SU, SUS, TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
42     COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
43     1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
44     2 SPRO(7), TGAING(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
45     C OBF(7), NMODE(7), NPROB, NREL, TLOW(7), TLGH(7)
```

OUTALL.FOR (cont'd.)

```

46      COMMON/SIGD/DSL,AMS,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU
47      A ,HTLOSS,XNUZ,XVE
48      DIMENSION TEMP(6)
49      CHARACTER MODE*2, LAYTYP*2
50      CHARACTER NNAME(22)*10, ISTAR*1, ITEMP(6)*2
51      CHARACTER IMON*3, IRCVR*10, ITRAN*10, MODER*2, MODVHF*2, IRLAT*1,
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1
35      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
36      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
37      C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)
38      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
39      COMMON / TON / ADJ, ADS, GNOS, GOT, PWRDB, REL, SL,
40      2 SLS, SPR, SU, SUS, XNOISE, ZNOISE, NF
41      COMMON / allMODE /ABPS(20),CREL(20),FLDST(20),HN(20),HP(20),
42      1PROB(20),RELY(20),RGAIN(20),SIGPOW(20),SN(20),
43      2SPRO(20),TGAIN(20),TIMED(20),TLOSS(20),B(20),FSLOS(20),
44      CNMODE(20),TLLOW(20),TLHG(20),EFF(20),NREL,NMMOD
45      COMMON/SIGD/DSL,AMS,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU
46      A ,HTLOSS,XNUZ,XVE
47      CHARACTER MODE*2, LAYTYP*2
48      CHARACTER NNAME(22)*10, ISTAR*1, ITEMP(20)*2
49      CHARACTER IMON*3, IRCVR*10, ITRAN*10, MODER*2, MODVHF*2, IRLAT*1,
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1
54      DATA NNAME/' TIME DEL.', ' ANGLE ', ' ABSORB ',
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1
52      CHARACTER f505*18,f512*34,f513*28
53      DATA NNAME/' TIME DEL.', ' ANGLE ', ' ABSORB ',
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1
61      IF(METHOD - 25) 625, 100, 625
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1
60      data f505,f512,f513/'( x,9h Most REL)', '(11x, (3x,f4.0,a2,1x),2
61      +x,f4.0,a2)', '(1x,a10, (1x,f9.2),2x,f9.2)'/
62      IF(METHOD - 25) 625, 100, 625
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1
75      SIGPW = NDBW(IF)
76      WRITE(JOUT,501) FREQ, GMT
77      WRITE(JOUT,505)
78      KNT = 0
79      DO 250 IM = 1,6
80      IF(MODE(IM) + 1.) 250, 250, 240
81      240 KNT = KNT + 1
82      TEMP(KNT) = HN(IM)
83      IS = NMODE(IM)
84      ITEMP(KNT) = LAYTYP(IS)
85      250 CONTINUE
86      WRITE(JOUT,512) (TEMP(IM),ITEMP(IM),IM=1,KNT), XNHP, MODE(IF)
87      KNT = 0

```

OUTALL.FOR (cont'd.)

```
88      DO 270 IM = 1,6
89      IF(HN(IM) + 1.) 270, 270, 260
90      260 KNT = KNT + 1
91      TEMP(KNT) = TIMED(IM)
92      270 CONTINUE
93      WRITE(JOUT,513) NNAME(1), (TEMP(IM),IM=1,KNT), DELAY(IF)
94      KNT = 0
95      DO 290 IM = 1,6
96      IF(HN(IM) + 1.) 290, 290, 280
97      280 KNT = KNT + 1
98      TEMP(KNT) = B(IM)
99      290 CONTINUE
100     WRITE(JOUT,513) NNAME(2), (TEMP(IM),IM=1,KNT), ANGLE(IF)
101     KNT = 0
102     DO 310 IM = 1,6
103     IF(HN(IM) + 1.) 310, 310, 300
104     300 KNT = KNT + 1
105     TEMP(KNT) = HP(IM)
106     310 CONTINUE
107     WRITE(JOUT,513) NNAME(18), (TEMP(IM),IM=1,KNT), VHIGH(IF)
108     KNT = 0
109     DO 314 IM = 1,6
110     IF(HN(IM) + 1.) 314, 314, 312
111     312 KNT = KNT + 1
112     TEMP(KNT) = TLOSS(IM)
113     314 CONTINUE
114     WRITE(JOUT,513) NNAME(9), (TEMP(IM),IM=1,KNT), DBLOS(IF)
115     KNT = 0
116     DO 705 IM = 1,5
117     IF(HN(IM)) 705,705,700
118     700 KNT = KNT + 1
119     TEMP(KNT) = TGAIN(IM)
120     705 CONTINUE
121     WRITE(JOUT,513) NNAME(5), (TEMP(IM),IM=1,KNT), TGAIN(NREL)
122     KNT = 0
123     DO 715 IM = 1,5
124     IF(HN(IM)) 715,715,710
125     710 KNT = KNT + 1
126     TEMP(KNT) = RGAIN(IM)
127     715 CONTINUE
128     WRITE(JOUT,513) NNAME(19), (TEMP(IM),IM=1,KNT), RGAIN(NREL)
129     KNT = 0
130     DO 725 IM = 1,5
131     IF(HN(IM)) 725,725,720
132     720 KNT = KNT + 1
133     TEMP(KNT) = ABPS(IM)
134     725 CONTINUE
135     WRITE(JOUT,513) NNAME(3), (TEMP(IM),IM=1,KNT)
136     KNT = 0
137     DO 735 IM = 1,5
138     IF(HN(IM)) 735,735,730
139     730 KNT = KNT + 1
140     TEMP(KNT) = FSLOS(IM)
141     735 CONTINUE
142     WRITE(JOUT,513) NNAME(4), (TEMP(IM),IM=1,KNT)
143     KNT = 0
144     DO 330 IM = 1,6
145     IF(HN(IM) + 1.) 330, 330, 320
146     320 KNT = KNT + 1
```

OUTALL.FOR (cont'd.)

```
147      TEMP(KNT) = FLDST(IM)
148 330 CONTINUE
149      WRITE(JOUT,513) NNAME(10), (TEMP(IM),IM=1,KNT), DBU(IF)
150      KNT = 0
151      DO 350 IM = 1,6
152      IF(HN(IM) + 1.) 350, 350, 340
153 340 KNT = KNT + 1
154      TEMP(KNT) = SIGPOW(IM)
155 350 CONTINUE
156      WRITE(JOUT,513) NNAME(11), (TEMP(IM),IM=1,KNT), SIGPW
157      KNT = 0
158      DO 370 IM = 1,6
159      IF(HN(IM) + 1.) 370, 370, 360
160 360 KNT = KNT + 1
161      TEMP(KNT) = SN(IM)
162 370 CONTINUE
163      WRITE(JOUT,513) NNAME(12), (TEMP(IM),IM=1,KNT), SNDB(IF)
164      KNT = 0
165      DO 390 IM = 1,6
166      IF(HN(IM) + 1.) 390, 390, 380
167 380 KNT = KNT + 1
168      TEMP(KNT) = PROB(IM)
169 390 CONTINUE
170      WRITE(JOUT,513) NNAME(13), (TEMP(IM),IM=1,KNT), CPROB(IF)
171      KNT = 0
172      DO 410 IM = 1,6
173      IF(HN(IM) + 1.) 410, 410, 400
174 400 KNT = KNT + 1
175      TEMP(KNT) = CREL(IM)
176 410 CONTINUE
177      WRITE(JOUT,513) NNAME(14), (TEMP(IM),IM=1,KNT), SNPR(IF)
178      KNT = 0
179      DO 430 IM = 1,6
180      IF(HN(IM) + 1.) 430, 430, 420
181 420 KNT = KNT + 1
182      TEMP(KNT) = RELY(IM)
183 430 CONTINUE
184      WRITE(JOUT,513) NNAME(15), (TEMP(IM),IM=1,KNT), RELIAB(IF)
185      KNT = 0
186      DO 450 IM = 1,6
187      IF(HN(IM) + 1.) 450, 450, 440
188 440 KNT = KNT + 1
189      TEMP(KNT) = SPRO(IM)
190 450 CONTINUE
191      WRITE(JOUT,513) NNAME(16), (TEMP(IM),IM=1,KNT), SPROB(IF)
192      KNT = 0
193      DO 490 IM = 1,6
194      IF( HN(IM) + 1.) 490,490,480
195 480 KNT = KNT +1
196      TEMP (KNT) = TLLOW (IM)
197 490 CONTINUE
198      WRITE(JOUT,513) NNAME(21), (TEMP(IM),IM =1,KNT),DBLOSL(IF)
199      KNT =0
200      DO 620 IM = 1,6
201      IF( HN(IM) +1. ) 620,620,610
202 610 KNT = KNT + 1
203      TEMP(KNT) = TLHGH(IM)
204 620 CONTINUE
```

OUTALL.FOR (cont'd.)

```

205      WRITE(JOUT,513) NNAME(22), (TEMP(IM),IM=1,KNT) ,DBLOSU(IF)
206      WRITE(JOUT,511) NYNOIS(IF), NDBW(IF)
207      WRITE(JOUT,502) DSL,AMS,DSU,SLS,ADS,SUS
208      WRITE(JOUT,503) DU, RCNSE, DL, SIGU, SIGM, SIGL
209      C
210      WRITE(JOUT,506) D90R, D50R, D10R

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1

```

76      SIGPW = DBW(IF)
77      WRITE(JOUT,501) NMMOD,FREQ, GMT
78      IST=NMMOD
79      DO 250 IM = 1,IST
80      IS = NMODE(IM)
81      ITEMP(IM) = LAYTYP(IS)
82      250 CONTINUE
83      if(NMMOD.lt.12)then
84          IST1=10*IST+13
85          write(f505(2:4),'(i3)')IST1
86          write(f512(6:7),'(i2)')IST
87          write(f513(9:10),'(i2)')IST
88          WRITE(JOUT,f505)
89          WRITE(JOUT,f512) (HN(IM),ITEMP(IM),IM=1,IST), XNHP, MODE(IF)
90          WRITE(JOUT,f513) NNAME(1), (timed(IM),IM=1,ist), DELAY(IF)
91          WRITE(JOUT,f513) NNAME(2), (B(IM),IM=1,IST), ANGLE(IF)
92          WRITE(JOUT,f513) NNAME(18), (hp(IM),IM=1,ist), VHIGH(IF)
93          WRITE(JOUT,f513) NNAME(9), (TLOSS(IM),IM=1,IST), DBLOS(IF)
94          WRITE(JOUT,f513) NNAME(5), (TGAIN(IM),IM=1,IST),TGAIN(NREL)
95          WRITE(JOUT,f513) NNAME(19), (RGAIN(IM),IM=1,IST), RGAIN(NREL)
96          WRITE(JOUT,f513) NNAME(3), (abps(IM),IM=1,ist)
97          WRITE(JOUT,f513) NNAME(4), (fslos(IM),IM=1,ist)
98          WRITE(JOUT,f513) NNAME(10), (FLDST(IM),IM=1,IST), DBU(IF)
99          WRITE(JOUT,f513) NNAME(11), (SIGPOW(IM),IM=1,IST), SIGPW
100         WRITE(JOUT,f513) NNAME(12), (SN(IM),IM=1,IST), SNDB(IF)
101         WRITE(JOUT,f513) NNAME(13), (prob(IM),IM=1,ist), CPROB(IF)
102         write(jout,f513) NNAME(14), (crel(IM),IM=1,ist), SNPR(IF)
103         WRITE(JOUT,f513) NNAME(15), (RELY(IM),IM=1,IST), RELIAB(IF)
104         WRITE(JOUT,f513) NNAME(16), (spro(IM),IM=1,ist), SPROB(IF)
105         WRITE(JOUT,f513) NNAME(21), (TLLOW(IM),IM =1,IST),DBLOSL(IF)
106         WRITE(JOUT,f513) NNAME(22), (TLHGH(IM),IM=1,IST) ,DBLOSU(IF)
107     else
108         write(f512(6:7),'(2h10)')
109         write(f513(9:10),'(2h10)')
110         WRITE(JOUT,f512) (HN(IM),ITEMP(IM),IM=1,10)
111         WRITE(JOUT,f513) NNAME(1), (timed(IM),IM=1,10)
112         WRITE(JOUT,f513) NNAME(2), (B(IM),IM=1,10)
113         WRITE(JOUT,f513) NNAME(18), (hp(IM),IM=1,10)
114         WRITE(JOUT,f513) NNAME(9), (TLOSS(IM),IM=1,10)
115         WRITE(JOUT,f513) NNAME(5), (TGAIN(IM),IM=1,10)
116         WRITE(JOUT,f513) NNAME(19), (RGAIN(IM),IM=1,10)
117         WRITE(JOUT,f513) NNAME(3), (abps(IM),IM=1,10)
118         WRITE(JOUT,f513) NNAME(4), (fslos(IM),IM=1,10)
119         WRITE(JOUT,f513) NNAME(10), (FLDST(IM),IM=1,10)
120         WRITE(JOUT,f513) NNAME(11), (SIGPOW(IM),IM=1,10)
121         WRITE(JOUT,f513) NNAME(12), (SN(IM),IM=1,10)
122         WRITE(JOUT,f513) NNAME(13), (prob(IM),IM=1,10)
123         write(jout,f513) NNAME(14), (crel(IM),IM=1,10)
124         WRITE(JOUT,f513) NNAME(15), (RELY(IM),IM=1,10)
125         WRITE(JOUT,f513) NNAME(16), (spro(IM),IM=1,10)

```

OUTALL.FOR (cont'd.)

```

126      WRITE(JOUT,f513) NNAME(21), (TLLOW(IM),IM =1,10)
127      WRITE(JOUT,f513) NNAME(22), (TLHGH(IM),IM=1,10)
128      LINES = LINES + NADD
129      IF(LINES - LINMAX) 330, 330, 320
130  C.....CALL SUBROUTINE OUTTOP TO OUTPUT HEADER LINES
131      320  CALL OUTTOP
132      LINES = LINTOP(10) + NADD
133      330  WRITE(JOUT,505)
134      WRITE(JOUT,505)
135      irem=ist-10
136      IST1=10*irem+13
137      write(f505(2:4),'(i3)')IST1
138      write(f512(6:7),'(i2)')irem
139      write(f513(9:10),'(i2)')irem
140      WRITE(JOUT,f505)
141      WRITE(JOUT,f512) (HN(IM),ITEMP(IM),IM=11,IST), XNHP, MODE(IF)
142      WRITE(JOUT,f513) NNAME(1), (timed(IM),IM=11,ist), DELAY(IF)
143      WRITE(JOUT,f513) NNAME(2), (B(IM),IM=11,IST), ANGLE(IF)
144      WRITE(JOUT,f513) NNAME(18), (hp(IM),IM=11,ist), VHIGH(IF)
145      WRITE(JOUT,f513) NNAME(9), (TLOSS(IM),IM=11,IST), DBLOS(IF)
146      WRITE(JOUT,f513) NNAME(5), (TGAIN(IM),IM=11,IST), TGAIN(NREL)
147      WRITE(JOUT,f513) NNAME(19), (RGAIN(IM),IM=11,IST), RGAIN(NREL)
148      WRITE(JOUT,f513) NNAME(3), (abps(IM),IM=11,ist)
149      WRITE(JOUT,f513) NNAME(4), (fslos(IM),IM=11,ist)
150      WRITE(JOUT,f513) NNAME(10), (FLDST(IM),IM=11,IST), DBU(IF)
151      WRITE(JOUT,f513) NNAME(11), (SIGPOW(IM),IM=11,IST), SIGPW
152      WRITE(JOUT,f513) NNAME(12), (SN(IM),IM=11,IST), SNDB(IF)
153      WRITE(JOUT,f513) NNAME(13), (prob(IM),IM=11,ist), CPROB(IF)
154      write(jout,f513) NNAME(14), (crel(IM),IM=11,ist), SNPR(IF)
155      WRITE(JOUT,f513) NNAME(15), (RELY(IM),IM=11,IST), RELIAB(IF)
156      WRITE(JOUT,f513) NNAME(16), (spro(IM),IM=11,ist), SPROB(IF)
157      WRITE(JOUT,f513) NNAME(21), (TLLOW(IM),IM =11,IST),DBLOSL(IF)
158      WRITE(JOUT,f513) NNAME(22), (TLHGH(IM),IM=11,IST), DBLOSU(IF)
159      endif
160      WRITE(JOUT,511) NYNOIS(IF), DBW(IF)
161      WRITE(JOUT,502) DSL,AMS,DSU,SLS,ADS,SUS
162      WRITE(JOUT,503) DU, RCNSE, DL, SIGU, SIGM, SIGL
163      WRITE(JOUT,506) D90R, D50R, D10R

```


File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```

213      501 FORMAT(' ',20X,'FREQ = ',F5.1,' MHZ',2X,'UT = ',F5.1)
214      502 FORMAT(' ', ' SIGNAL = ',3(2X,F5.1),' /',3(2X,F5.1))
215      503 FORMAT(' ', ' NOISE = ',3F7.1,' /',3F8.1)

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1

```

166      501 FORMAT(' SUMMARY ',I3,' MODES   FREQ = ',F5.1,' MHZ  UT = ',F5.1)
167      502 FORMAT(' ', ' SIGNAL = ',3(2X, 5x),' /',3(2X,F5.1))
168      503 FORMAT(' ', ' NOISE = ',3F7.1,' /',3F8.1)

```


File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTALL.FOR;1

```

219      511 FORMAT(' ', ' NOISE = ',I6,5X,' S. POWER = ',I6)
220      512 FORMAT(' ',10X,7(3X,F4.0,A2,1X))
221      513 FORMAT(' ',A10,7(1X,F9.3))
222      END

```

OUTALL.FOR (cont'd.)

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTALL.FOR;1
172      511 FORMAT(' ', ' NOISE = ',I6,5X, ' S. POWER = ',F6.1)
173      END
```

Number of difference sections found: 9
Number of difference records found: 168

OUTANT.FOR

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTANT.FOR;1
17      C NUMNAM, NUPROC, MAXMET
18      COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTANT.FOR;1
17      C NUMNAM, NUPROC, MAXMET, mspec, ml00
18      COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTANT.FOR;1
23      COMMON / METSET / VERSN, ITRUN, ITOUT
24      COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14),
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTANT.FOR;1
23      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
24      COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14),
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTANT.FOR;1
94      A ,I =14,30,2),M,LET
95      140 CONTINUE
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTANT.FOR;1
94      A ,I =14,30,2)
95      140 CONTINUE
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTANT.FOR;1
113     500 FORMAT('1',32X,'METHOD',I3,3X,'IONCAP ',F5.2,3X,'PAGE',I4,/)
114     502 FORMAT(' ', 'ITS-',I2, ' ANTENNA PACKAGE',26X,'ANTENNA PATTERN',
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTANT.FOR;1
113     500 FORMAT(1H1,32X,'METHOD',I3,3X,'IONCAP ',F5.2,3X,'PAGE',I4,/)
114     502 FORMAT(' ', 'ITS-',I2, ' ANTENNA PACKAGE',26X,'ANTENNA PATTERN',
```

```
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTANT.FOR;1
120     508 FORMAT(1X,A1,1X,I2,21F6.1,1X,I2,1X,A1)
121     510 FORMAT('0',48X,'FREQUENCY IN MEGAHERTZ')
122     512 FORMAT('0',48X,'ANTENNA EFFICIENCY',/, ' ',4X,21F6.1)
123      END
```

```
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTANT.FOR;1
120     508 FORMAT(1X,A1,1X,I2,21F6.1)
121     510 FORMAT(/,/,48X,'FREQUENCY IN MEGAHERTZ')
122     512 FORMAT(/,/,48X,'ANTENNA EFFICIENCY',/, ' '4X,21F6.1)
123      END
```

OUTANT.FOR (cont'd.)

Number of difference sections found: 5
Number of difference records found: 7

OUTBOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
14      C NUMNAM, NUPROC, MAXMET
15      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
16      A LU26, LU35, LU61
17      COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
18      A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD
19      B ,BRTD,FLUX,SSN,ATMNO
20      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
21      COMMON/FRQ/FREL(29),FREQ
22      COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
14      C NUMNAM, NUPROC, MAXMET, mspec, ml00
15      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
16      A LU26, LU35, LU61
17      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
18      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
19      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
20      COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
21      COMMON / FRQ / FREL(29), FREQ, JMODE
22      COMMON/MUFS/EMUF(24),F1MUF(24),F2MUF(24),ESMUF(24),ALLMUF(24)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
28      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
29      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
28      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
29      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
34      COMMON/TIME/ IT,GMT,UTIME(24)
35      CHARACTER NBLANK*6, NFIVE*6, NSEVEN*6, NEIGHT*6, NDASH*4, LNG4*6,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
34      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
35      CHARACTER NBLANK*6, NFIVE*6, NSEVEN*6, NEIGHT*6, NDASH*4, LNG4*6,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
41      DATA NBLANK/'      '/, NFIVE/' ,1X)  '/, NSEVEN/'(A4,1X'/'
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
41      INTEGER ITMP(13)
42      DATA NBLANK/'      '/, NFIVE/' ,1X)  '/, NSEVEN/'(A4,1X'/'
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
118     225 IFMT(4) = NFMT(3)
119     CALL FLOLIN(VHIGH,4)
120     230 IF(LINBOD(5)) 240, 240, 235
```

OUTBOD.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
119      225 IFMT(4) = NFMT(2)
120          DO 226 II=1,13
121      226 ITMP(II)=vhigh(II)+SIGN(.5,vhigh(II))
122          CALL FIXLIN(ITMP,4)
123      230 IF(LINBOD(5)) 240, 240, 235
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
124      245 IFMT(4) = NFMT(3)
125          CALL FLOLIN(DBLOS,6)
126      250 IF(LINBOD(7)) 260, 260, 255
127      255 IFMT(4) = NFMT(3)
128          CALL FLOLIN(DBU,7)
129      260 IF(LINBOD(8)) 270, 270, 265
130      265 IFMT(4) = NFMT(2)
131          CALL FIXLIN(NDBW,8)
132      270 IF(LINBOD(9)) 280, 280, 275
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
127      245 IFMT(4) = NFMT(2)
128          DO 246 II=1,13
129      246 ITMP(II)=dblos(II)+SIGN(.5,dblos(II))
130          CALL FIXLIN(ITMP,6)
131      250 IF(LINBOD(7)) 260, 260, 255
132      255 IFMT(4) = NFMT(2)
133          DO 256 II=1,13
134      256 ITMP(II)=dbu(II)+SIGN(.5,dbu(II))
135          CALL FIXLIN(ITMP,7)
136      260 IF(LINBOD(8)) 270, 270, 265
137      265 IFMT(4) = NFMT(2)
138          DO 266 II=1,13
139      266 ITMP(II)=DBW(II)+SIGN(.5,DBW(II))
140          CALL FIXLIN(ITMP,8)
141      270 IF(LINBOD(9)) 280, 280, 275
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTBOD.FOR;1

```
136      285 IFMT(4) = NFMT(3)
137          CALL FLOLIN(SNDB,10)
138      290 IF(LINBOD(11)) 300, 300, 295
139      295 IFMT(4) = NFMT(3)
140          CALL FLOLIN(SNPR,11)
141      300 IF(LINBOD(12)) 310, 310, 305
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTBOD.FOR;1

```
145      285 IFMT(4) = NFMT(2)
146          DO 286 II=1,13
147      286 ITMP(II)=sndb(II)+SIGN(.5,sndb(II))
148          CALL FIXLIN(ITMP,10)
149      290 IF(LINBOD(11)) 300, 300, 295
150      295 IFMT(4) = NFMT(2)
151          DO 296 II=1,13
152      296 ITMP(II)=snpr(II)+SIGN(.5,snpr(II))
153          CALL FIXLIN(ITMP,11)
154      300 IF(LINBOD(12)) 310, 310, 305
```

OUTBOD.FOR (cont'd.)

Number of difference sections found: 7
Number of difference records found: 38

OUTCOM.FOR

Number of difference sections found: 0
Number of difference records found: 0

OUTGPH.FOR

Number of difference records found: 0

OUTION.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTION.FOR;1

```
5      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
6      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
7      2, KFX, AFAC (30, 3), HNOR (3)
8      DO 100 K=1,KFX
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTION.FOR;1

```
5      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
6      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
7      2HTR(50), FNSQ(50)
8      DO 100 K=1,KFX
```

Number of difference sections found: 1
Number of difference records found: 3

OUTKMF.FOR

Number of difference sections found: 0
Number of difference records found: 0

OUTLAY.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTLAY.FOR;1

```
11     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
12     IF(LINES - LINMAX) 110, 100, 100
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTLAY.FOR;1

```
11     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
12     IF(LINES - LINMAX) 110, 100, 100
```

Number of difference sections found: 1
Number of difference records found: 1

OUTLIN.FOR

Number of difference records found: 0

OUTLNG.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTLNG.FOR;1

```
4      COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,
5      1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
6      2 TLAT, TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
```

OUTLNG.FOR (cont'd.)

```

7          COMMON / FRQ / FREL(29), FREQ, JMODE
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTLNG.FOR;1
4          COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
5          1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
6          2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
7          COMMON / FRQ / FREL(29), FREQ, JMODE
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTLNG.FOR;1
13         3 DELPEN(3,3)
14         COMMON / LONG / DXMTR, DIKM, DTOP, DGRND, DRCVR, XLOSS, XLT, XLFG,
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTLNG.FOR;1
13         3 DELPEN(3,5)
14         COMMON / LONG / DXMTR, DIKM, DTOP, DGRND, DRCVR, XLOSS, XLT, XLFG,
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTLNG.FOR;1
18         COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
19         IF(LUO.EQ.LU6) LOUT = LU16
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTLNG.FOR;1
18         COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
19         IF(LUO.EQ.LU6) LOUT = LU16
*****
                        Number of difference sections found: 3
                        Number of difference records found: 5
```

OUTMUF.FOR

```

*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTMUF.FOR;1
14         COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
15         DIMENSION XFMT(5)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTMUF.FOR;1
14         COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
15         DIMENSION XFMT(5)
*****
                        Number of difference sections found: 1
                        Number of difference records found: 1
```

OUTPAR.FOR

```

*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTPAR.FOR;1
3          C      THIS ROUTINE OUTPUTS IONOSPHERIC PARAMETERS
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTPAR.FOR;1
3          C      STATEMENTS 501 AND 502 OF THIS SUBROUTINE HAVE BEEN MODIFIED
4          C      TO REDUCE OUTPUT LINES TO 132 OR FEWER CHARACTERS AND THUS
5          C      PRINTABLE ON THE SSDVAX LINE PRINTER
6          C      MARK DAEHLER, 24 OCTOBER 1985
7          C
8          C
9          C      THIS ROUTINE OUTPUTS IONOSPHERIC PARAMETERS
*****
*****
```

OUTPAR.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTPAR.FOR;1

```
6      COMMON / DON / ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR,
7      1 GCD, GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR,
8      2 TLAT, TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
9      COMMON / ES / FS(3,5), HS(5)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTPAR.FOR;1

```
12     COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
13     1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
14     2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
15     COMMON / ES / FS(3,5), HS(5)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTPAR.FOR;1

```
17     COMMON / RON / CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5)
18     1 , HI(3,5), HPRIM(30,3), HTRUE(30,3), FVERT(30,3), KM, KFX,
19     2 AFAC(30,3), HNOR(3), FX(3,5), HTR(50), FNSQ(50)
20     COMMON / TIME / IT, GMT, UTIME(24)
21     COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTPAR.FOR;1

```
23     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
24     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
25     2HTR(50), FNSQ(50)
26     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
27     COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTPAR.FOR;1

```
56     A 'Y1',5X,'H1',3X,'FH/2',3X,'F22',4X,'Y2',5X,'H2',4X,'ES',3X,'MED',
57     B 4X,'HI',1X,'M3000',3X,'HPF2',3X,'RAT',4X,'ZEN',2X,'ZMAX',3X,
58     C 'MAGL')
59     502 FORMAT(' ',F5.1,A1,1X,F5.1,A1,2F6.1,F6.2,2F6.1,2F7.1,2F6.1,F7.1,
60     1 3F6.1,F6.2,F7.1,F6.1,F7.1,F6.1,F7.1,A1)
61     503 FORMAT(' ')
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTPAR.FOR;1

```
62     C      A 'Y1',5X,'H1',3X,'FH/2',3X,'F22',4X,'Y2',5X,'H2',4X,'ES',3X,'MED',
63     C      B 4X,'HI',1X,'M3000',3X,'HPF2',3X,'RAT',4X,'ZEN',2X,'ZMAX',3X,
64     C      C 'MAGL')
65     A 'Y1',5X,'H1',2X,'FH/2',3X,'F22',4X,'Y2',5X,'H2',3X,'ES',2X,'MED',
66     B 3X,'HI',1X,'M3000',3X,'HPF2',3X,'RAT',4X,'ZEN',2X,'ZMAX',2X,
67     C 'MAGL')
68     502 FORMAT(' ',F5.1,A1,1X,F5.1,A1,2F6.1,F6.2,2F6.1,F7.1,3F6.1,F7.1,
69     1 3F5.1,F6.2,F7.1,F6.1,F7.1,F6.1,F6.1,A1)
70     503 FORMAT(' ')
```

Number of difference sections found: 4
Number of difference records found: 21

OUTTAB.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTTAB.FOR;1

```
10     A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDEW(13), NHP(13),
11     B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTTAB.FOR;1

```
10     A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
11     B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

OUTTAB.FOR (cont'd.)

Number of difference sections found: 1
Number of difference records found: 1

OUTTOP.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTTOP.FOR;1

```
23      A ),YND(3,2),YNL(3,2),YNH(3,2),TEY(3,4,2)
24      COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
25      COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
26      A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD
27      B ,BRTD,FLUX,SSN,ATMNO
28      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTTOP.FOR;1

```
23      A ),YND(3,2),YNL(3,2),YNH(3,2),TEY(3,4,2),toaz(3,2)
24      COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
25      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
26      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
27      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
28      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTTOP.FOR;1

```
33      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
34      COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTTOP.FOR;1

```
33      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
34      COMMON / OUTPRT / LINBOT(30), LINBD(14), LINTOP(15), LINTP(14),
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTTOP.FOR;1

```
39      COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,RCNSE,REL,SL,SLS,SPR,SU,SUS
40      A ,TIMER,XADJN,XEFF,XNOISE,XTLOS,ZNOISE,NF
41      DIMENSION XFRQB(2)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTTOP.FOR;1

```
39      COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS
40      A ,XNOISE,ZNOISE,NF
41      DIMENSION XFRQB(2)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]OUTTOP.FOR;1

```
131     1500 FORMAT('1',32X,'METHOD',I3,3X,'IONCAP ',F5.2,3X,'PAGE',I4,/)
132     1502 FORMAT(' ',12X,A3,3X,A5,10X,'SSN = ',F4.0)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]OUTTOP.FOR;1

```
131     1500 FORMAT(1H1,32X,'METHOD',I3,3X,'IONCAP ',F5.2,3X,'PAGE',I4,/)
132     1502 FORMAT(' ',12X,A3,3X,A5,10X,'SSN = ',F4.0)
```

Number of difference sections found: 4
Number of difference records found: 9

PEN.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]PEN.FOR;1

5 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
6 X = F/FI(I,K)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]PEN.FOR;1

5 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
6 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
7 2HTR(50), FNSQ(50)
8 X = F/FI(I,K)

Number of difference sections found: 1

Number of difference records found: 3

PENANG.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]PENANG.FOR;1

10 3, DELPEN(3,3)
11 COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]PENANG.FOR;1

10 3, DELPEN(3,5)
11 COMMON /MODES /GHOP, DELMOD (6, 3), HPMOD (6, 3), HTMOD (6, 3), FV

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]PENANG.FOR;1

14 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
15 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
16 2, KFX, AFAC (30, 3), HNOR (3)
17 COMMON / FRQ / FREL(29), FREQ
18 FMHZ = FREQ

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]PENANG.FOR;1

14 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
15 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
16 2HTR(50), FNSQ(50)
17 COMMON / FRQ / FREL(29), FREQ, JMODE
18 FMHZ = FREQ

Number of difference sections found: 2

Number of difference records found: 5

PRBMUF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]PRBMUF.FOR;1

1 FUNCTION PRBMUF(FMHZ,FGO,FSET,IL)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]PRBMUF.FOR;1

1
2 FUNCTION PRBMUF(FMHZ,FGO,FSET,IL)

Number of difference sections found: 1

Number of difference records found: 1

REDMAP.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REDMAP.FOR;1

8 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
9 2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
10 COMMON / FILES / LUI, LUC, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REDMAP.FOR;1

8 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
9 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
10 COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REDMAP.FOR;1

20 COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
21 COMMON / REFLX / DELFX(45,3), HPFLX(45,3), HTFLX(45,3),

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REDMAP.FOR;1

20 COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
21 COMMON / REFLX / DELFX(45,3), HPFLX(45,3), HTFLX(45,3),

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REDMAP.FOR;1

24 C DELPEN(3,3)
25 COMMON / SSP / SUN(2,12), MONTH

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REDMAP.FOR;1

24 C DELPEN(3,5)
25 COMMON / SSP / SUN(2,12), MONTH

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REDMAP.FOR;1

35 C.....EQUIVALENCE ALL DATA FILE VARIABLES TO IFOB(40,30,3)
36 EQUIVALENCE(STOCOF(1), IFOB(1,1,1))

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REDMAP.FOR;1

35 C.....EQUIVALENCE ALL DATA FILE VARIABLES TO IFOB(40,30,5)
36 EQUIVALENCE(STOCOF(1), IFOB(1,1,1))

Number of difference sections found: 4

Number of difference records found: 5

REGMOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

6 C
7 COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM, SXGU, SXGL, KJ, JK
8 COMMON /SSP /SUN (2, 12), MONTH

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

6 C
7 COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),
8 A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,
9 B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,
10 C NUMNAM, NUPROC, MAXMET, mspec, m100
11 COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM, SXGU, SXGL, KJ, JK
12 COMMON /SSP /SUN (2, 12), MONTH

REGMOD.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```

17      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
18      2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
19      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
20      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
21      B,KFX,AFAC(30,3),HNOR(3),FX(3,5)
22      COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```

21      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
22      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
23      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
24      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
25      2HTR(50), FNSQ(50)
26      COMMON /RTANT /XETA, XSIG, XEPS, XND, XNL, XNH, TEX (4), ITANT, IR

```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```

25      1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
26      2 SPRO (7), TGAIn (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
27      C (7), OBF(7), NMODE(7), NPROB, NREL, TLLOW(7), TLHGH(7)
28      COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, XCNSE, REL, SL, SLS
29      A ,SPR, SU, SUS, TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
30      COMMON / FRQ / FREL(29), FREQ, JMODE

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```

29      1 HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
30      2 SPRO(7), TGAIn(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
31      3 OBF(7), NMODE(7), TLLOW(7), TLHGH(7)
32      COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
33      A ,SPR, SU, SUS, XNOISE, ZNOISE, NF
34      COMMON / FRQ / FREL(29), FREQ, JMODE

```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```

39      COMMON / RAYS / ANG(40), IFOB(40,30,3), NANG
40      COMMON /TIME /IT, GMT, UTIME (24)
41      DIMENSION LX(3)

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```

43      COMMON / RAYS / ANG(40), IFOB(40,30,5), NANG
44      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
45      DIMENSION LX(3)

```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```

45      C TEMPORARILY FILL A SELECTED MODES INTO COMMON/ZON/
46      C SHOULD DO THIS BY A EQUAL TAKEOFF ANGLE SEARCH IN COMMON/REFLX/

```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```

49      C TEMPORARILY FILL A SELECTED MODES INTO COMMON/ZON
50      C SHOULD DO THIS BY A EQUAL TAKEOFF ANGLE SEARCH IN COMMON/REFLX/

```

REGMOD.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```
79  C.....BEGINNING OF PRESET OF COMMON/ZON/
80      DO 240 IM = 1,7
81      ITRY =1
82      100 CONTINUE
83      OBF(IM) = 1000.
84      ADV(IM) = 1000.
85      FSLOS(IM)=1000.
86      TLOSS(IM)=1000.
87      ABPS(IM) =1000.
88      EFF(IM)  = 0.0
89      GRLOS(IM)=1000.
90      RGAIN(IM)= 0.0
91      TGAIN(IM)= 0.0
92      HN(IM)  = -1.
93      PROB(IM) = 0.001
94      CREL(IM) = 0.001
95      RELY(IM) = 0.001
96      SPRO(IM) = 0.001
97      FLDST(IM) = -1000.0
98      SIGPOW(IM)=-1000.
99      SN(IM)=-1000.
100     TIMED(IM) = -1.
101     HP  (IM) = -1.
102     B   (IM) = -1.
103     NMODE(IM) = 5
104     TLLOW(IM) = 10.
105     TLHGH(IM) = 10.
106  C.....ENDING OF PRESET OF COMMON/ZON/
107     IF(IM -7 ) 101,240,240
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```
83      DO 240 IM = 1,7
84      ITRY =1
85  C.....PRESET IN COMMON/ZON/
86      HN(IM) = -1.
87      HP  (IM) = -1.
88      IF(IM -7 ) 101,240,240
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]REGMOD.FOR;1

```
209  C.....GAIN AT TRANSMITTER
210      CALL GAIN(1,KASANT,DEL,FREQ,DUMMY,TEFF)
211      TGAIN(IM) = DUMMY
212      195 CONTINUE
213  C.....GAIN AT RECEIVER
214      CALL GAIN(2,KASANT,DEL,FREQ,DUMMY1,DUMMY2)
215      RGAIN(IM) = DUMMY1
216      EFF(IM) = DUMMY2
217      200 CONTINUE
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]REGMOD.FOR;1

```
190      if(mspec.ne.125)then
191  C.....GAIN AT TRANSMITTER
192      CALL GAIN(1,KASANT,DEL,FREQ,DUMMY,TEFF)
193      TGAIN(IM) = DUMMY
194  C.....GAIN AT RECEIVER
195      CALL GAIN(2,KASANT,DEL,FREQ,DUMMY1,DUMMY2)
```

REGMOD.FOR (cont'd.)

```
196      RGAIN(IM) = DUMMY1
197      EFF(IM) = DUMMY2
198      else
199      c.....set gains and eff to 0. dB or unity
200          tgain(im)=0.
201          rgain(im)=0.
202          eff(im)=0.
203      endif
204      200 CONTINUE
*****
      Number of difference sections found: 7
      Number of difference records found: 61
```

RELBIL.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1

```
33      COMMON / ALPHA / IMON(12), IRCVR(2), ITRAN(2), MODE(13),
34      A MODER(13), MODVHF(13), IRLAT, IRLONG, ITLAT, ITLONG, NYEAR
35      COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK
36      COMMON /CON /D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL
37      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
38      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
39      2ATD,TLONG,TLONGD,BTRD,FLUX,SSN,ATMNO,D90R,D50R,D10R,D90S,D50S,D10S
40      COMMON / FRQ / FREL(29), FREQ
41      COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1

```
33      c
34      COMMON / CONTRL / IELECT(3), KTOUT(12), MONTHS(12), SUNSP(12),
35      A IANTOU, ICARD, INTEG, IRED, ISOUT, ISPROC, ISSN, ITYPE, JDASH,
36      B JFREQ, JLONG, KCARD, KRUN, MAPIN, MAXNAM, MONOLD, MOREM, MORES,
37      C NUMNAM, NUPROC, MAXMET, mspec, m100
38      COMMON / ALPHA / IMON(12), IRCVR(2), ITRAN(2), MODE(13),
39      A MODER(13), MODVHF(13), IRLAT, IRLONG, ITLAT, ITLONG, NYEAR
40      COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SXGU,SXGL,KJ,JK
41      COMMON /CON /D2R, DCL, GAMA, PI, PI2, PIO2, R2D, RZ, VOFL
42      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
43      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
44      2 TLATD,TLONG,TLONGD,BTRD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
45      COMMON / FRQ / FREL(29), FREQ, JMODE
46      COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH, IHRE,
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1

```
44      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
45      COMMON/MUFS/EMUF(24),FIMUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1

```
49      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
50      COMMON/MUFS/EMUF(24),FIMUF(24),F2MUF(24),ESMUF(24),ALLMUF(24),FOT
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1

```
54      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
55      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
56      C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)
```

RELBIL.FOR (cont'd.)

```

57      COMMON /TON /ADJ, ADS, ATMO, GNOS, GOT, PWRDB, ZCNSE, REL, SL, SLS
58      1, SPR, SU, SUS, TIMER, XADJN, ZEFF, XNOISE, XTLOS, ZNOISE, NF
59      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
60      1HN (7), HP (7), PROB (7), RELY (7), RGAIN (7), SIGPOW (7), SN (7),
61      2 SPRO (7), TGAIN (7), TIMED (7), TLOSS (7), B (7), FSLOS (7), ADV
62      C(7), OBF(7), NMODE(7), NPROB, NREL, TLLOW(7), TLHGH(7)
63      DIMENSION TME(10)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
59      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
60      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
61      C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)
62      COMMON /TON /ADJ, ADS, GNOS, GOT, PWRDB, REL, SL, SLS
63      1, SPR, SU, SUS, XNOISE, ZNOISE, NF
64      COMMON / allMODE /ABPS(20),CREL(20),FLDST(20),HN(20),HP(20),
65      1PROB(20),RELY(20),RGAIN(20),SIGPOW(20),SN(20),
66      2SPRO(20),TGAIN(20),TIMED(20),TLOSS(20),B(20),FSLOS(20),
67      CNMODE(20),TLLOW(20),TLHGH(20),EFF(20),NREL,NMMOD
68      DIMENSION TME(10)
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
72      D50R = RSN
73      D10R = 20.
74      D90R = 20.
75      C.....BEGINNING OF RELIABILITY CALCULATION FOR EACH MODE
76      C
77      C.....USED TO SELECT 1 OF UP TO 6 MODES FOR EACH HOP
78      C.....ON THE LAST CALL THE MOST RELIABLE WILL BE OUTPUT
79      DO 310 IM = 1,6
80      IF( HP(IM) - 70. ) 105,105,110
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
77      C.....
78      INUM=NMMOD
79      C.....IF NO MODES RETURN.....
80      IF(INUM.LE.0)RETURN
81      C.....BEGINNING OF RELIABILITY CALCULATION FOR EACH MODE
82      C.....USED TO SELECT 1 OF UP TO 20 MODES FOR EACH FREQ
83      DU2=DU*DU
84      DL2=DL*DL
85      DO 310 IM = 1,INUM
86      IF( HP(IM) - 70. ) 105,105,110
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
87      C REQUIRED SIGNAL TO NOISE DISTRIBUTION
88      286 D10R = SQRT(DL*DL + DSLF*DSLF)
89      D50R = SN(IM)
90      D90R = SQRT( DU*DU + DSUF*DSUF )
91      Z = RSN - D50R
92      IF( Z ) 290,290,295
93      290 Z = Z/( D10R/1.28)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
93      C.....REQUIRED SIGNAL TO NOISE DISTRIBUTION
94      D10R = SQRT(DL2 + DSLF*DSLF)
95      D50R = SN(IM)

```

RELBIL.FOR (cont'd.)

```

96      D90R = SQRT( DU2 + DSUF*DSUF )
97      Z = RSN - D50R
98      IF( Z ) 290,290,295
99      290 Z = Z/( D10R/1.28)
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
108      JIN = 1
109      DO 140 IM= 2,6
110      IF( HP(IM) ) 140,140,118
111      118 CONTINUE
112      JIN = JIN +1
113      C.....MAKE SELECTION BASED ON RELIABILITY FIRST BUT IF CLOSE SELECT ON
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
114      C.....IF ONLY ONE MODE USE IT.....
115      IF(INUM.EQ.1)GO TO 145
116      DO 140 IM= 2,INUM
117      C.....MAKE SELECTION BASED ON RELIABILITY FIRST BUT IF CLOSE SELECT ON
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
116      IF( ABS(RELY(IM) - XREL) - XEPS ) 120,120,135
117      120 IF(ABS(XHN - HN(IM)) - XEPS) 125, 125, 121
118      121 IF(XHN - HN(IM)) 140, 125, 130
119      125 IF( XSN - SN(IM) ) 130,140,140
120      130 IR = IM
121      XHN=HN(IM)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
120      IF( ABS(RELY(IM) - XREL).LE.XEPS )THEN
121      C.....CLOSE SO TEST IF NUMBER OF HOPS ARE EQUAL.....
122      IF(ABS(XHN - HN(IM)).LE.XEPS)THEN
123      C.....NUMBER OF HOPS ARE EQUAL SO TEST MEDIAN SNR.....
124      IF( XSN.LT.SN(IM) )GO TO 139
125      ELSE IF(XHN.GT.HN(IM))THEN
126      C.....THIS ONE HAS FEWER HOPS.....
127      GO TO 139
128      ENDIF
129      ELSE IF(RELY(IM).GT.XREL)THEN
130      C.....THIS ONE IS MORE RELIABLE TRY IT.....
131      GO TO 139
132      ENDIF
133      GO TO 140
134      C.....THIS MODE IS BETTER SO TRY IT.....
135      139 IR = IM
136      XHN=HN(IM)
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
124      GO TO 140
125      135 IF(RELY(IM)-XREL) 140,120,130
126      140 CONTINUE
127      IF( HP(IR) ) 355,355,145
128      145 CONTINUE
```

RELBIL.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1

139 140 CONTINUE
140 145 CONTINUE

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1

```
131 NPROB = IR
132 IF ( JIN-1 ) 360,360,365
133 360 RELIAB(IF) = RELY(IR)
134 DBLOSL(IF) = TLLOW(IR)
135 DBLOSU(IF) = TLHGH(IR)
136 DBU(IF) = FLDST(IR)
137 SNDB(IF) = SN(IR)
138 NDBW(IF) = SIGPOW(IR)
139 GO TO 372
140 365 CONTINUE
141 C ADD THE SIGNALS (RANDOM PHASE APPROXIMATION = ADD THE POWERS IN WATTS
142 XDSLW = 0.0
143 XSIGS = 0.0
144 XDSUP = 0.0
145 XFLD = 0.
146 DO 370 IM = 1,6
147 IF( HP(IM) ) 370,370,366
148 366 ZEXP = .1*(SIGPOW(IM) - TLLOW(IM) )
149 ZEXP = AMAX1 (ZEXP, -100. )
150 XDSLW = XDSLW + 10. ** ZEXP
151 ZEXP = .1*SIGPOW(IM)
152 ZEXP = AMAX1 (ZEXP, -100. )
153 XSIGS = XSIGS +10. ** ZEXP
154 ZEXP = .1 * (SIGPOW(IM) + TLHGH(IM))
155 ZEXP = AMAX1 (ZEXP, -100. )
156 XDSUP = XDSUP + 10. ** ZEXP
157 C MUST DO FIELD STRENGTH SEPARATE BECAUSE OF RECEIVE ANTENNA
158 ZEXP = .1*FLDST(IM)
159 ZEXP = AMAX1(ZEXP,-100.)
160 XFLD = XFLD + 10.**ZEXP
161 370 CONTINUE
162 SIGMED = 4.343*ALOG(XSIGS)
163 DBLOSL(IF) = ABS( SIGMED - 4.343*ALOG(XDSLW) )
164 DBLOSU(IF) = ABS( 4.343*ALOG(XDSUP) - SIGMED )
165 NDBW(IF) = SIGMED
166 DELSIG = SIGMED - SIGPOW(IR)
167 DBU(IF) = 4.343*ALOG(XFLD)
168 SNDB(IF) = SN(IR) + DELSIG
169 372 CONTINUE
170 C REDO RELIABILITY FOR SUM OF MODES
171 D10R = SQRT( DL*DL + DBLOSL(IF)*DBLOSL(IF) )
172 D50R = SNDB(IF)
173 D90R = SQRT( DU*DU + DBLOSU(IF)*DBLOSU(IF) )
174 SNRLW(IF) = D10R
175 SNRUP(IF) = D90R
176 Z = RSN - D50R
177 IF( Z ) 375,375,380
178 375 Z = Z/(D10R/1.28)
179 GO TO 385
180 380 Z = Z/(D90R/1.28)
181 385 RELIAB(IF) = 1. - FNORML(Z)
182 ANGLE(IF) = B(IR)
```

RELBIL.FOR (cont'd.)

```

183      CPROB (IF)= PROB (IR)
184      DBLOS (IF)= TLOSS(IR)
185      DELAY (IF)= TIMED(IR)
186      VHIGH (IF)= HP   (IR)
187      MODE  (IF)= LAYTYP(IS)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
143      IF(INUM.eq.1)THEN
144  C.....ONLY ONE MODE SO SET MOST RELIABLE VALUES.....
145          RELIAB(IF) = RELY(IR)
146          DBLOSL(IF) = TLOW(IR)
147          DBLOSU(IF) = TLHG(IR)
148          DBU(IF) = FLDST(IR)
149          SNDB(IF) = SN(IR)
150          DBW(IF) = SIGPOW(IR)
151      ELSE
152  C.....ADD THE SIGNALS RANDOM PHASE i.e. ADD THE POWERS IN WATTS....
153          XDSLW = 0.0
154          XSIGS = 0.0
155          XDSUP = 0.0
156          XFLD = 0.
157          DXSIGS=-1000.
158          DXFLD=-1000.
159          DXDSLW=-1000.
160          DXDSUP=-1000.
161          DO 369 IV=1,INUM
162              DXSIGS=AMAX1(DXSIGS,SIGPOW(IV))
163              DXFLD=AMAX1(DXFLD,FLDST(IV))
164              DXDSLW=AMAX1(DXDSLW,SIGPOW(IV)-TLOW(IV))
165              DXDSUP=AMAX1(DXDSUP,SIGPOW(IV)+TLHG(IV))
166 369      CONTINUE
167          DO 370 IM = 1,INUM
168              ZEXP = .1*(SIGPOW(IM) - TLOW(IM)-DXDSLW)
169              XDSLW = XDSLW + 10. ** ZEXP
170              ZEXP = .1*(SIGPOW(IM)-DXSIGS)
171              XSIGS = XSIGS +10. ** ZEXP
172              ZEXP = .1 * (SIGPOW(IM) + TLHG(IM)-DXDSUP)
173              XDSUP = XDSUP + 10. ** ZEXP
174  C  MUST DO FIELD STRENGTH SEPARATE BECAUSE OF RECEIVE ANTENNA
175              ZEXP = .1*(FLDST(IM)-DXFLD)
176              XFLD = XFLD + 10.**ZEXP
177 370      CONTINUE
178              SIGMED = DXSIGS+ 4.343*ALOG(XSIGS)
179              DBLOSL(IF) = ABS( SIGMED - 4.343*ALOG(XDSLW)-DXDSLW )
180              DBLOSU(IF) = ABS( DXDSUP+4.343*ALOG(XDSUP) - SIGMED )
181              DBW(IF) = SIGMED
182              DELSIG = SIGMED - SIGPOW(IR)
183              DBU(IF) = DXFLD + 4.343*ALOG(XFLD)
184              SNDB(IF) = SN(IR) + DELSIG
185  C.....REDO RELIABILITY FOR SUM OF MODES.....
186              D10R = SQRT( DL2 + DBLOSL(IF)*DBLOSL(IF) )
187              D50R = SNDB(IF)
188              D90R = SQRT( DU2 + DBLOSU(IF)*DBLOSU(IF) )
189              Z = RSN - D50R
190              IF( Z ) 375,375,380
191 375          Z = Z/(D10R/1.28)
192              GO TO 385
193 380          Z = Z/(D90R/1.28)

```

RELBIL.FOR (cont'd.)

```
194      385  RELIAB(IF) = 1. - FNORML(Z)
195      ENDIF
196      SNRLW(IF) = D10R
197      SNRUP(IF) = D90R
198      ANGLE(IF) = B(IR)
199      VHIGH(IF)=HP(IR)
200      DELAY(IF)=TIMED(IR)
201      DBLOS (IF)= TLOSS(IR)
202      CPROB(IF)=PROB(IR)
203      MODE (IF)= LAYTYP(IS)
*****
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]RELBIL.FOR;1
190      XEFF = EFF(1)
191      ZEFF = EFF(1)
192  C  REQUIRED POWER GAIN  FOR SPECIFIED RELIABILITY.
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]RELBIL.FOR;1
206  C  REQUIRED POWER GAIN  FOR SPECIFIED RELIABILITY.
*****
                        Number of difference sections found: 10
                        Number of difference records  found: 125
```

SANG.FOR

```
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SANG.FOR;1
7      COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
8      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
9      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT, TL
10     2ATD, TLONG, TLONGD, BRTD, FLUX, SSN, ATMNO
11     DIMENSION NANGX(8)
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SANG.FOR;1
7      COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
8      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
9      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
10     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
11     DIMENSION NANGX(8)
*****
                        Number of difference sections found: 1
                        Number of difference records  found: 4
```

SELMOD.FOR

```
*****
File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SELMOD.FOR;1
7      COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
8      1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
9      B ,KFX,AFAC(30,3),HNOR(3),FX(3,5)
10     IF(KFX -1) 100,100,105
*****
File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SELMOD.FOR;1
7      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
8      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
9      2HTR(50), FNSQ(50)
10     IF(KFX -1) 100,100,105
*****
                        Number of difference sections found: 1
                        Number of difference records  found: 3
```

SELRCR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SELRCR.FOR;1

```
8      COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM
9      COMMON / LOSX / ANDVX(45,3), ADVX(45,3), AOFX(45,3), ARFX(45,3),
10     1 GRLOSX(45,3), TGAIX(45,3), TLSKM(45,3)
11     COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
12     COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
13     COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
14     A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3)
15     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,3)
16     LRGM =1
17     DEND = AMIN1(GCDKM,4000.)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SELRCR.FOR;1

```
8      COMMON /DON /ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,
9      1 GCDKM,PMP,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,
10     2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
11     COMMON/LOSX/ANDVX(45,3),ADVX(45,3),AOFX(45,3),ARFX(45,3),GRLOSX(45
12     A ,3),TGAIX(45,3),TLSKM(45,3),AANEW(45,3),TDFLX(45,3),FSFLX(45,3)
13     COMMON/LPATH/ GCDLNG,TGML(45),RGML(45),DELOPT,GMIN,YMIN,LTGM,LRGM
14     COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
15     COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
16     A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3)
17     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,5)
18     LRGM =1
19     IF(GDFLX(2,3).EQ.0.)RETURN
20     DEND = AMIN1(GCDKM,4000.)
```

Number of difference sections found: 1
Number of difference records found: 12

SELTMT.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SELTMT.FOR;1

```
6      COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM
7      COMMON / LOSX / ANDVX(45,3), ADVX(45,3), AOFX(45,3), ARFX(45,3),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SELTMT.FOR;1

```
6      COMMON /DON /ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,
7      1 GCDKM,PMP,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,
8      2 TLATD,TLONG,TLONGD,BRTD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
9      COMMON / LOSX / ANDVX(45,3), ADVX(45,3), AOFX(45,3), ARFX(45,3),
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SELTMT.FOR;1

```
10     COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
11     COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
12     A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3)
13     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,3)
14     DEND = AMIN1(GCDKM,4000.)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SELTMT.FOR;1

```
12     COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
13     COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
14     A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3)
15     B ,ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,5)
16     DEND = AMIN1(GCDKM,4000.)
```

SELTMT.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SELTMT.FOR;1

17 GO TO 105

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SELTMT.FOR;1

19 IF(GDFLX(2,1).EQ.0.)RETURN

20 GO TO 105

Number of difference sections found: 3

Number of difference records found: 8

SERPRB.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SERPRB.FOR;1

12 COMMON/ANOIS/ATNU,ATNY,CC,TM,XEFF,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK

13 COMMON/CON/D2R,DCL,GAMA,PI,PIO2,R2D,RZ,VOFL

14 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP

15 A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD

16 B ,BRTD,FLUX,SSN,ATMNO,D90R,D50R,D10R,D90S,D50S,D10S

17 COMMON/FRQ/FREL(29),FREQ

18 COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH,IHRE,

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SERPRB.FOR;1

12 COMMON/ANOIS/ATNU,ATNY,CC,TM,RCNSE,DU,DL,SIGM,SIGU,SIGL,KJ,JK

13 COMMON/CON/D2R,DCL,GAMA,PI,PIO2,R2D,RZ,VOFL

14 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,

15 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,

16 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S

17 COMMON / FRQ / FREL(29), FREQ, JMODE

18 COMMON / ION / IANT(3,2), NTR(2), IEA, IFQB, IFQE, IGRAPH,IHRE,

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SERPRB.FOR;1

21 COMMON/METSET/VERSN,ITRUN,ITOUT,JTRUN(40),JTOUT(40)

22 COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13),

23 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),

24 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

25 C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)

26 COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,ZCNSE,REL,SL,SLS,SPR,SU,SUS

27 A ,TIMER,XADJN,ZEFF,XNOISE,XTLOS,ZNOISE,NF

28 COMMON/ZON/ABPS(7),CREL(7),EFF(7),FLDST(7),GRLOS(7),HN(7),HP(7)

29 A ,PROB(7),RELY(7),RGAIN(7),SIGPN(7),SN(7),SPRO(7),TGAIN(7),TIMED

30 B(7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7),NPROB,NREL

31 C , TLLOW(7),TLHGH(7)

32 DIMENSION TME(10)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SERPRB.FOR;1

21 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS

22 COMMON / SON / ANGLE(13), ANGLER(13), CPROB(13), DBLOS(13),

23 A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),

24 B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),

25 C SNRLW(13), SNRUP(13), SPROB(13), VHIGH(13)

26 COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS

27 A ,XNOISE,ZNOISE,NF

28 COMMON / allMODE /ABPS(20),CREL(20),FLDST(20),HN(20),HP(20),

29 1PROB(20),RELY(20),RGAIN(20),SIGPOW(20),SN(20),

30 2SPRO(20),TGAIN(20),TIMED(20),TLOSS(20),B(20),FSLOS(20),

31 CNMODE(20),TLLOW(20),TLHGH(20),EFF(20),NREL,NMMOD

32 DIMENSION TME(10)

SERPRB.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SERPRB.FOR;1

44 DO 145 IM = 1,6

45 IF(HP(IM) - 70.) 100,100,105

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SERPRB.FOR;1

44 DO 145 IM = 1,NMMOD

45 IF(HP(IM) - 70.) 100,100,105

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SERPRB.FOR;1

84 SPROB(IF) = AMAX1(SPRO(1),SPRO(2),SPRO(3),SPRO(4),SPRO(5),SPRO(6))

85 RETURN

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SERPRB.FOR;1

84 AMXX=-1000.

85 DO 150 I=1,NMMOD

86 IF(SPRO(I).GT.AMXX)AMXX=SPRO(I)

87 150 CONTINUE

88 SPROB(IF)=AMXX

89 RETURN

Number of difference sections found: 4

Number of difference records found: 23

SETGPH.FOR

Number of difference sections found: 0

Number of difference records found: 0

SETLNG.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLNG.FOR;1

5 COMMON /RAYS/ ANG(40), IFOB(40,30,3), NANG

6 COMMON/ES/FS(3,5),HS(5)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLNG.FOR;1

5 COMMON /RAYS/ ANG(40), IFOB(40,30,5), NANG

6 COMMON/ES/FS(3,5),HS(5)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLNG.FOR;1

9 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)

10 A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)

11 B ,FX(3,5),HTR(50),FNSQ(50)

12 IF(KFX -3) 105,100,100

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLNG.FOR;1

9 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),

10 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),

11 2HTR(50), FNSQ(50)

12 IF(KFX -3) 105,100,100

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLNG.FOR;1

18 DO 120IS =2,5

19 CLAT(IS) = CLAT(1)

SETLNG.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLNG.FOR;1

```
18      DO 120 IS =2,5
19      CLAT(IS) = CLAT(1)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLNG.FOR;1

```
44      HNOR(IS) = HNOR(1)
45      FX(1,IS) = FX(1,1)
46      FX(2,IS) = FX(2,1)
47      FX(3,IS) = FX(3,1)
48      DO 125 IL= 1,30
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLNG.FOR;1

```
44      DO 125 IL= 1,30
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLNG.FOR;1

```
82      HNOR(3) =HNOR(2)
83      FX(1,3) = FX(1,2)
84      FX(2,3) = FX(2,2)
85      FX(3,3) = FX(3,2)
86      DO 150 IL = 1,30
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLNG.FOR;1

```
78      DO 150 IL = 1,30
```

Number of difference sections found: 5

Number of difference records found: 13

SETLUF.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLUF.FOR;1

```
3      C.....COMPUTED RELIABILITIES. THESE VALUES ARE CHANGED IN SUBROUTINES
4      C.....SHTLUF OR GETLUF IF THE LUF IS ACTUALLY COMPUTED
5      C
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLUF.FOR;1

```
3      C.....COMPUTED RELIABILITIES. THESE VALUES ARE CHANGED IN SUBROUTINE
4      C.....GETLUF IF THE LUF IS ACTUALLY COMPUTED
5      C
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETLUF.FOR;1

```
15      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), NDBW(13), NHP(13),
16      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETLUF.FOR;1

```
15      A DBLOSL(13), DBLOSU(13), DBU(13), DELAY(13), DBW(13), NHP(13),
16      B NYNOIS(13), PROBMP(13), RELIAB(13), SNDB(13), SNPR(13),
```

Number of difference sections found: 2

Number of difference records found: 3

SETOUT.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETOUT.FOR;1

```
12      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
13      COMMON / MUFS / EMUF(24), F1MUF(24), F2MUF(24), ESMUF(24),
```

SETOUT.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETOUT.FOR;1

12 COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
13 COMMON / MUFS / EMUF(24), F1MUF(24), F2MUF(24), ESMUF(24),

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETOUT.FOR;1

17 COMMON / TIME / IT, GMT, UTIME(24), GMTR
18 C.....SET MUFS TO -1

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETOUT.FOR;1

17 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
18 C.....SET MUFS TO -1

Number of difference sections found: 2

Number of difference records found: 2

SETRCR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETRCR.FOR;1

8 COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
9 A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD
10 B ,BRTD,FLUX,SSN,ATMNO
11 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
12 COMMON/ES/FS(3,5),HS(5)
13 COMMON/FRQ/FREL(29),FREQ
14 COMMON/GEOG/GYZ(5),RAT(5),GMDIP(5),CLCK(5),ABII(5),ARTIC(5),SIGPAT

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETRCR.FOR;1

8 COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
9 1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
10 2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
11 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
12 COMMON/ES/FS(3,5),HS(5)
13 COMMON / FRQ / FREL(29), FREQ, JMODE
14 COMMON/GEOG/GYZ(5),RAT(5),GMDIP(5),CLCK(5),ABII(5),ARTIC(5),SIGPAT

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETRCR.FOR;1

24 COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
25 COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
26 A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3
27 B),ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,3)
28 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
29 B ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)
30 C ,FX(3,5)
31 COMMON/RTANT/XETA,XSIG,XEPS,XND,XNL,XNH,TEX(4),ITANT,IRANT,RETA,
32 A RSIG, REPS, RND, RNL, RNH, REX(4), TEFF, REFF, KASANT
33 COMMON/TIME/ IT,GMT,WTIME(24)
34 COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,RCNSE,REL,SL,SLS,SPR,SU,SUS
35 A ,TIMER,XADJN,XEFF,XNOISE,XTLOS,ZNOISE,NF
36 COMMON/ZON/ABPS(7),CREL(7),EFF(7),FLDST(7),CRLOS(7),HN(7),HP(7)
37 A ,PROB(7),RELY(7),RGAIN(7),SIGPOW(7),SN(7),SPRO(7),TGAIN(7),TIMED
38 B (7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7),NPROB,NREL
39 C ,TLLOW(7),TLHG(7)
40 DEND = AMIN1(4000.,GCDKM)

SETRCR.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETRCR.FOR;1

```
24      COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
25      COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
26      A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3
27      B ),ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,5)
28      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
29      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
30      2HTR(50), FNSQ(50)
31      COMMON/RTANT/XETA,XSIG,XEPS,XND,XNL,XNH,TEX(4),ITANT,IRANT,RETA,
32      A RSIG, REPS, RND, RNL, RNH, REX(4), TEFF, REFF, KASANT
33      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
34      COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS
35      A ,XNOISE,ZNOISE,NF
36      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
37      1 HN(7), HP(7), PROB(7), RELY(7), KGAIN(7), SIGPOW(7), SN(7),
38      2 SPRO(7), TGAING(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
39      3 OBF(7),NMODE(7),TLLOW(7),TLHG(7)
40      DEND = AMIN1(4000.,GCDKM)
```

Number of difference sections found: 2
Number of difference records found: 22

SETTMT.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETTMT.FOR;1

```
6      COMMON/DON/ALATD,AMIN,AMIND,BTR,BTRD,DLONG,DMP,ERTR,GCD,GCDKM,PMP
7      A ,PWR,RLAT,RLATD,RLONG,RLONGD,RSN,SIGTR,TLAT,TLATD,TLONG,TLONGD
8      B ,BRTD,FLUX,SSN,ATMNO
9      COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
10     COMMON/ES/FS(3,5),HS(5)
11     COMMON/FRQ/FREL(29),FREQ
12     COMMON/GEOG/GYZ(5),RAT(5),GMDIP(5),CLCK(5),ABIY(5),ARTIC(5),SIGPAT
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETTMT.FOR;1

```
6      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
7      1 GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
8      2 TLATD, TLONG, TLONGD, BRTD, FLUX, SSN, D90R, D50R, D10R, D90S, D50S, D10S
9      COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
10     COMMON/ES/FS(3,5),HS(5)
11     COMMON / FRQ / FREL(29), FREQ, JMODE
12     COMMON/GEOG/GYZ(5),RAT(5),GMDIP(5),CLCK(5),ABIY(5),ARTIC(5),SIGPAT
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SETTMT.FOR;1

```
22     COMMON/RAYS/ANG(40),IFOB(40,30,3),NANG
23     COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
24     A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMAXKM(3),FVSKP(3
25     B ),ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,3)
26     COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
27     B ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)
28     C ,FX(3,5)
29     COMMON/RTANT/XETA,XSIG,XEPS,XND,XNL,XNH,TEX(4),ITANT,IRANT,RETA,
30     1 RSIG, REPS, RND, RNL, RNH, REX(4), TEFF, REFF, KASANT
31     COMMON/TIME/ IT,GMT,WTIME(24)
32     COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,RCNSE,REL,SL,SLS,SPR,SU,SUS
33     A ,TIMER,XADJN,XEFF,XNOISE,XTLOS,ZNOISE,NF
34     COMMON/ZON/ABPS(7),CREL(7),EFF(7),FLDST(7),CRLOS(7),HN(7),HP(7)
35     A,PROB(7),RELY(7),RGAIN(7),SIGPOW(7),SN(7),SPRO(7),TGAING(7),TIMED
```

SETTMT.FOR (cont'd)

```
36      B (7),TLOSS(7),B(7),FSLOS(7),ADV(7),OBF(7),NMODE(7),NPROB,NREL
37      C ,TLOW(7),TLHG(7)
38      C.....FOR MAX. NUMBER OF HOPS
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SETTMT.FOR;1

```
22      COMMON/RAYS/ANG(40),IFOB(40,30,5),NANG
23      COMMON/REFLX/DEFLX(45,3),HPFLX(45,3),HTFLX(45,3),GDFLX(45,3),FVFLX
24      A (45,3),DSKPKM(3),DELSKP(3),HPSKP(3),HTSKP(3),DMSKPM(3),FVSKP(3
25      B ),ISKP(3),IMODE(45,3),AFFLX(45,3),DELPEN(3,5)
26      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
27      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
28      2HTR(50), FNSQ(50)
29      COMMON/RTANT/XETA,XSIG,XEPS,XND,XNL,XNH,TEX(4),ITANT,IRANT,RETA,
30      1RSIG,REPS,RND,RNL,RNH,REX(4),TEFF,REFF,KASANT
31      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
32      COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS
33      A ,XNOISE,ZNOISE,NF
34      COMMON / ZON / ABPS(7), CREL(7), EFF(7), FLDST(7), GRLOS(7),
35      1HN(7), HP(7), PROB(7), RELY(7), RGAIN(7), SIGPOW(7), SN(7),
36      2SPRO(7), TGAIR(7), TIMED(7), TLOSS(7), B(7), FSLOS(7), ADV(7),
37      3OBF(7),NMODE(7),TLOW(7),TLHG(7)
38      C.....FOR MAX. NUMBER OF HOPS
```

Number of difference sections found: 2
Number of difference records found: 22

SIGDIS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SIGDIS.FOR;1

```
14      COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
15      A ,HPRIM(30,3),HTRUE(30,3),FVERT(30,3),KM,KFX,AFAC(30,3),HNOR(3)
16      B ,FX(3,5),HTR(50),FNSQ(50)
17      COMMON/SIGD/DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU
18      A ,HTLOSS,XNUZ,XVE
19      COMMON/TIME/IT,GMT,UTIME(24),GMTR,XLMT(24)
20      COMMON/TON/ADJ,ADS,ATMO,GNOS,GOT,PWRDB,RCNSE,REL,SL,SLS,SPR,SU,SUS
21      A ,TIMER,XADJN,XEFF,XNOISE,XTLOS,ZNOISE,NF
22      GLAV = 0.0
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SIGDIS.FOR;1

```
14      COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
15      1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
16      2HTR(50), FNSQ(50)
17      COMMON/SIGD/DSL,ASM,DSU,AGLAT,DSL,ASMF,DSUF,ACAV,FEAV,AFE,BFE,HNU
18      A ,HTLOSS,XNUZ,XVE
19      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
20      COMMON/TON/ADJ,ADS,GNOS,GOT,PWRDB,REL,SL,SLS,SPR,SU,SUS
21      A ,XNOISE,ZNOISE,NF
22      COMMON /DON /ALATD, AMIN, AMIND, BTR, BTRD, DLONG, DMP, ERTR, GCD,
23      1GCDKM, PMP, PWR, RLAT, RLATD, RLONG, RLONGD, RSN, SIGTR, TLAT,
24      2TLATD,TLONG,TLONGD,BTRD,FLUX,SSN,D90R,D50R,D10R,D90S,D50S,D10S
25      GLAV = 0.0
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]SIGDIS.FOR;1

```
39      CALL SYSSY(DUMMY1,DUMMY2,2,ADJ,SU,SL,FMP,SUP,SLP)
40      C.....MEDIAN
```

SIGDIS.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]SIGDIS.FOR;1

42 IDP=2
43 IF(GCDKM.GT.2500.)IDP=5
44 CALL SYSSY(DUMMY1,DUMMY2,IDP,ADJ,SU,SL,FMP,SUP,SLP)
45 C.....MEDIAN

Number of difference sections found: 2
Number of difference records found: 14

SYSSY.FOR

Number of difference sections found: 0
Number of difference records found: 0

TABBOD.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]TABBOD.FOR;1

13 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
14 DIMENSION XFMT(13)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]TABBOD.FOR;1

13 COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
14 DIMENSION XFMT(13)

Number of difference sections found: 1
Number of difference records found: 1

TABS.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]TABS.FOR;1

6 COMMON/FRQ/FREL(29),FREQ
7 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
8 COMMON/RON/CLAT(5),CLONG(5),GLAT(5),RD(5),FI(3,5),YI(3,5),HI(3,5)
9 COMMON/GEORG/GYZ(5)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]TABS.FOR;1

6 COMMON / FRQ / FREL(29), FREQ, JMODE
7 COMMON/CON/D2R,DCL,GAMA,PI,PI2,PIO2,R2D,RZ,VOFL
8 COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
9 1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5),KM,KFX, AFAC(30,5),
10 2HTR(50), FNSQ(50)
11 COMMON/GEORG/GYZ(5)

Number of difference sections found: 1
Number of difference records found: 5

TIMVAR.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]TIMVAR.FOR;1

8 COMMON /TIME /IT, GMT, UTIME (24)
9 COMMON /CON /AK, DCL, GAMA, PI, PI2, PIO2, BK, RZ, VOFL
10 COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
11 1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
12 2, KFX
13 COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5)

TIMVAR.FOR (cont'd.)

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]TIMVAR.FOR;1

```
8      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
9      COMMON /CON /AK, DCL, GAMA, PI, PI2, PIO2, BK, RZ, VOFL
10     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
11     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
12     2HTR(50), FNSQ(50)
13     COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5)
```

Number of difference sections found: 1

Number of difference records found: 5

VERSY.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]VERSY.FOR;1

```
13     COMMON /RON /CLAT (5), CLONG (5), GLAT (5), RD (5), FI (3, 5), YI
14     1(3, 5), HI (3, 5), HPRIM (30, 3), HTRUE (30, 3), FVERT (30, 3), KM
15     2, KFX
16     COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5)
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]VERSY.FOR;1

```
13     COMMON /RON /CLAT(5), CLONG(5), GLAT(5), RD(5), FI(3,5), YI(3,5),
14     1HI(3,5), HPRIM(30,5), HTRUE(30,5), FVERT(30,5), KM, KFX, AFAC(30,5),
15     2HTR(50), FNSQ(50)
16     COMMON /GEOG /GYZ (5), RAT (5), GMDIP (5), CLCK (5), ABIY (5)
```

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]VERSY.FOR;1

```
19     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24)
20     COMMON / TWO / F2D(16,6,6), P(29,16,8), ABP(2,8), DUD(5,12,5),
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]VERSY.FOR;1

```
19     COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
20     COMMON / TWO / F2D(16,6,6), P(29,16,8), ABP(2,8), DUD(5,12,5),
```

Number of difference sections found: 2

Number of difference records found: 4

VIRTIM.FOR

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]VIRTIM.FOR;1

```
6      COMMON /TIME /IT, GMT, UTIME (24)
7      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
8      A LU26, LU35, LU61
9      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40)
10     C.....THE TWO DIMENSIONAL ARRAYS ARE HERE USED AS A SINGLE DIMENSION
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]VIRTIM.FOR;1

```
6      COMMON / TIME / IT, GMT, UTIME(24), GMTR, XLMT(24), ITIM, JTX
7      COMMON / FILES / LUI, LUO, LU2, LU5, LU6, LU15, LU16, LU20, LU25,
8      A LU26, LU35, LU61
9      COMMON / METSET / VERSN, ITRUN, ITOUT, JTRUN(40), JTOUT(40), LSEAS
10     C.....THE TWO DIMENSIONAL ARRAYS ARE HERE USED AS A SINGLE DIMENSION
```

VIRTIM.FOR (cont'd.)

File USD1:[VOALIB.IONCAP.SOURCE.ORIG]VIRTIM.FOR;1

```
57      500 FORMAT('1',10X,'TIME VARIATION CANNOT BE DONE BECAUSE THE LONG',  
58          A' TERM COEFFICIENTS ARE NOT SET.',/,11X,'CHECK KRUN, IF CORRECT',  
59          B ' THEN THE MONTH - SUNSPOT CARD IS PROBABLY WRONG OR MISSING.')
```

File USD1:[DAEHLER.VOALIB.NEWCAP.SOURCE]VIRTIM.FOR;1

```
57      500 FORMAT(1H1,10X,'TIME VARIATION CANNOT BE DONE BECAUSE THE LONG'  
58          A,' TERM COEFFICIENTS ARE NOT SET.',/,11X,'CHECK KRUN, IF CORRECT',  
59          B ' THEN THE MONTH - SUNSPOT CARD IS PROBABLY WRONG OR MISSING.')
```

Number of difference sections found: 2

Number of difference records found: 6

XLIN.FOR

Number of difference sections found: 0

Number of difference records found: 0

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